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GAS JOURNAL

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[Founded in 1849 as the "Journal of Gas Lighting."]

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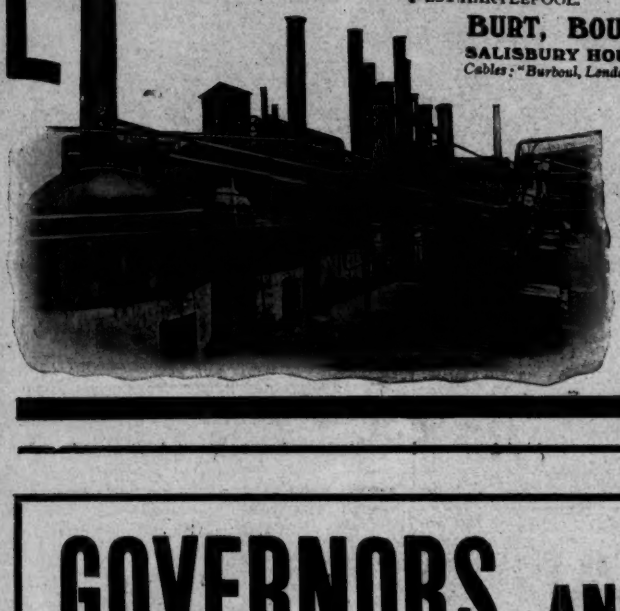

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VOL. CLXX., No. 3229.] WEDNESDAY, APRIL 1, 1925. [77TH YEAR.

EDITORIAL NOTES.

HENRY EDWARD JONES.

THE announcement in last week's "JOURNAL" of the death of Mr. Henry Edward Jones has been received throughout the gas industry with profound sorrow, for he had an individuality in our midst which endeared him to us all. The members of the family have the consolation of knowing that their grief is shared by countless friends in the industry. The end was unexpected. We all knew that our friend had journeyed through his eightieth year; his intimates realized that he was about to complete his eighty-second year. But the vigour of mind and body to the finish seemed a contradiction of the four-score years and more. The passing fitted the life—it might almost be said to have been characteristic of it; for until just before the silent call, Mr. Jones had been pursuing the activities of, for him in latter years, a normal day. He had in early morning been interesting himself in business matters associated with at any rate one of the gas undertakings with which he was administratively concerned; he had had a run with the Essex hounds—the greatest of his pleasures and recreations. Only the space of thirty minutes parted usual activity and final rest.

A vacant place has been made in our midst which cannot be filled; for we know of no one in the industry possessing the same composite traits as our departed friend. The length of personal experience in all the ramifications of the gas industry, the fundamental and detailed knowledge of its affairs, the devoted application of that knowledge in administrative and professional capacity, taken together, remained almost without rival as the little group of front rank contemporaries left the scene of their labours. Mixed with those qualities and the wisdom with which they were used and applied, were wit and an irrepressible cheerfulness—even in gloomy and stressful days. We have known that Mr. Jones could be brusque and plain spoken; we always knew that what he said he meant and what he meant he said. Never, however, did he hesitate to praise when deserved. He was a sportsman and large-hearted. Those who were trained under him for the gas profession—his "boys"—have to thank him for his insistence on application and discipline; and among them we do not know of a single one who in after life did not thank their "lucky stars" that they were brought up on the engineering and managerial regimen of "H. E. J." They ever afterwards looked upon him as their guide, philosopher, and friend; and he was the first to whom they turned when in need of counsel. On the several Boards of which he was Chairman or an ordinary member—mostly the former—his fellow administrators will sadly miss him. His sound common-sense, his technical advice, his outspoken criticisms, his quick discernment and ability to make prompt decisions, and his plainness in expressing his views, together with his fine geniality, caused his colleagues to have an admiration for him of a nature which age and experience alone could not have commanded. In administrative work he progressed with time's changes; he never allowed the traditions of the past to cling about him and impede his movements. He was always for advance. "Cheap gas" was a favourite term which in his practices was translated into reality—anyway, to the utmost extent to which he could carry it in the circumstances of the times. In the quest for means of realizing this dominant object, and in his practices, he was keen on securing and maintaining a low capital account. A low capital account and cheap gas were close companions in his mind and actually. But he did not seek a low capital per unit of production by starving works or purchasing inefficient plant. There was a strong belief in the wisdom of spending to secure efficiency; but he found the point where economic efficiency ended, and declined to pay an uneconomic price for any efficiency beyond.

Above all things Mr. Jones was an engineer; and he was proud of his profession—not only so, he was jealous of it. But pride and jealousy alone will not take a man to the highest pinnacles of such a profession. There must be ability of pronounced and varied order. That ability was a possession of our late friend which took him to a foremost place in the profession. Not only gas engineers, but his compeers in other branches of engineering recognized his talent; and they were proud—as he felt the distinction and the honour—to have him in the Presidential Chair of the Institution of Civil Engineers. As a consulting engineer he had a large practice, even before he relinquished the office of Chief Engineer and General Manager of the Commercial Gas Company, and went to Westminster. His advice was much sought; and his presence in the Parliamentary Committee rooms in connection with Private Gas Bills was constant in the old days, before the war and Special Orders interrupted the former normal course of things. In the past half century, there has been no great gas fight affecting the general interests of the industry in which he has not been concerned—always on the side of the industry, never against it. He was one of the gas engineering and administrative experts whom eminent leaders at the Parliamentary Bar preferred to have with and not against them. There was nothing subtle about him or his evidence. Its quality and soundness, its openness and frankness, impressed and were persuasive, and carried weight with the Committees of both Houses. A great power in the industry has finished its course.

We look back over a considerable stretch of years in which "H. E. J." has had such prominent place and (until now) an unceasing part in the work of the industry. So inseparably associated with gas affairs has he become in our minds that it is difficult to believe that he is no longer with us. We shall all miss him; but, while sorrow at his loss will remain, his gifts and charming characteristics, and what he has taught and done, will be imperishable and happy memories with those of us among whom he has lived and moved. *Vale!*

A Matter of Pressing Importance.

THE Presidential Address to which the members of the Southern District Association of Gas Engineers and Managers listened last Tuesday week was the work of an observer and a student of the trend of things in the gas industry, and withal a keen worker in its interests. Mr. Philip G. G. Moon, the Engineer and General Manager of the Bournemouth Gas and Water Company, in preparing the address, concentrated his thoughts on those affairs that are of immediate outstanding concern to the industry; and he led up to them by referring, with modesty but gratification, to the remarkably fine record that the Bournemouth Company can show of progress in their gas supply business. This has necessitated the construction of new works at Pitwines, which incorporate several imposing features of engineering interest, about which

there will be an opportunity of saying more on a future occasion. The record of gas progress at Bournemouth has about it a robust and genial aspect; but it is merely a reflection of what is going on all over the country, subject to the limitations set by local conditions. However, the prosperity in regard to gas sales (which, it is hoped, will not be interrupted by the current set-back in the markets for secondary products) must not cause us to close our eyes to, or simply to smile complacently upon, what is going on around us in the political world, aided and abetted by both subterranean and open fostering by our principal competitors, who are trying, on congenial soil, to obtain an advantage to the disadvantage of the gas industry. It may be considered by some that the far higher efficiency of the gas process in relation to the utilization of our fuel supply is a sufficient palladium against anything that can be done through political avenues in favour of our electrical competitors. That is partially, but by no means completely, true. Therefore it must be the business of the gas industry in the first place to do what it can to resist the conferring of any exclusive advantage on the electricity industry which, if there is realization, must in some degree (to what extent no one can predict) be to the detriment of the gas industry, if it takes the form of preferential treatment—say, through subsidization. But apart from direct effects, we detect beneath the words in the address of the President and in the remarks by Sir Arthur Duckham at the close of its reading, an appeal for the consideration of the matter from a higher point of view—and that a national one—by an industry which is, through the utilization of coal, doing immeasurably more in the service of the country than are the public electricity supply undertakings (apart from traction). When an industry such as ours sees that mistakes are being made, when we have within our keeping the proof that they are mistakes, and are the fruits of misconception and misguidance, then it is a duty and a responsibility to correct them. If we do not do this with boldness and perseverance, if we lose an opportunity of promulgating the truth, then we are betraying our trust, and should deserve all the unwelcome results which lethargy brought upon us.

The President pointed out that there are many political men who do not realize the more important place occupied by gas than electricity in the economy of the country's fuel supplies, while acknowledging that electricity has a sphere of service which it can and does fill with advantage to the community, but real advantage can only be within that sphere. The ignorance in this regard that prevails among some politicians is well illustrated by a privately expressed statement of a prominent member of Parliament, that he has no place for the consideration of anything but electricity where light, heat, and power are concerned; also by the book on "Coal and Power" which bore the name of Mr. Lloyd George; by the attitude of the late Labour-Socialist Government; as well as by certain expressions of opinion by present Ministers. The facts as to the efficiency of the utilization of coal by the gas process and by the electrical, as vividly presented in Mr. Moon's address, are unknown to the bulk of our legislators; and therefore no wonder that the glamour which has been so sedulously thrown round electricity has taken hold of them. The gas industry cannot altogether exonerate itself from blame in this regard. It is true that we had an invaluable report from Sir Dugald Clerk and Professors Smithells and Cobb which demonstrated the comparative efficiencies of the two processes; but has sufficient widespread use been made of that report, or of plainly stated data such as are found in Mr. Moon's address? He takes the figures applying to electricity supply in this country in 1923. The fuel used amounted to 7,356,757 tons, and from that coal the equivalent of 169·4 million therms was produced—the average consumption of coal being 3·32 lbs. per kw.h. Assuming that coal had been used at twice the efficiency, the output in therms would have been only 338·8 millions. Using that same quantity of coal in the gas process, at 70 therms per ton 515 million therms would have been produced as gas and 989 million therms as coke, to say nothing of tar and sulphate of ammonia. The coke, if turned into producer gas, and used for the generation of electricity, would generate 2747 million units of electricity. "The moral," says the President, "is obvious." Do our legislators know these facts? Have they been placed before them in a manner which they as laymen in these matters can understand? We think not.

We have to get well beyond what has been done. Sir Arthur Duckham says that while the gas industry has very fine specialized propaganda, he does not believe that any of us have formulated in our minds how a programme of fuel development in the country should be put forward from the national point of view. He says, as is also stated in the address, that a small Committee of distinguished men have been appointed for this purpose. This is good and satisfactory; and the hope he expresses, that the Committee will come to really sound conclusions, will, we are sure, run through the industry, because up to now the fuel problem has not been handled soundly in this country—it has only been treated from a very narrow point of view. But the industry has to get its economic facts home; has to show the country that a greater extravagance in providing for its heat requirements is simply a flight to further national uneconomy and inefficiency. Mr. Moon is favourable to very broad action. His opinion, which will be powerfully backed in the industry, is that co-ordinated effort is required, and he proceeds:

> I think the time is over-ripe for the formation of a permanent Committee drawn from the leading administrators, engineers, scientists, and publicists of the industry, whose definite duty it should be to impress upon the country by means of lectures by eminent scientists, by newspaper articles and pamphlets, and by representations to all political parties, the fundamental thermal facts of gas manufacture and electricity generation and their effect upon the nation's fuel resources. I hope my remarks will not be interpreted as in any way belittling the great and growing importance of electricity and the part it plays in the home and industrial life of the nation.

Those remarks were written before there was knowledge on the President's part as to the appointment of a Committee; but they show the feeling of one influential engineer, and that it is not solitary is testified by the action of the Manchester Institution of Gas Engineers in addressing a communication to the other Associations regarding the much-talked-of subsidizing of the electricity industry out of national funds, as well as by the resolution passed at the largely attended Southern meeting. The latter recorded that the members had heard with pleasure of the formation of a Committee of distinguished men to consider the position; and it urged that the Committee should take the necessary steps to impress the position upon the country by means of lectures, newspaper articles, &c., and most particularly by putting the true economic facts with regard to both industries before Members of Parliament. It was also submitted that the latter action should be taken without delay, as the members of the Association feel that, while the gas industry has nothing to fear from the fair competition of the electrical industry, the booming of the latter for political purposes, if allowed to proceed further without strong opposition, can only end disastrously for the country as a whole. This shows that the gas profession will be prepared to give the strongest possible support to a full and vigorous policy which will have counteractive effect upon political misconceptions and proposals in this regard.

That the matter requires speeding-up and prosecuting in a broadcast manner is seen from the debate on unemployment in the House last Thursday. In the febrific imaginations of some of our politicians, electrical development is the cure for all our troubles. On the occasion referred to, Sir A. Steel Maitland said: "The real scheme, *which "is profitable on every conceivable ground,* is the electricity scheme. That scheme is being pressed forward "as rapidly as possible, but no human being could get "through a scheme of that elaboration in a short time." Does that reflect the views of the whole Government? We do not know; but the Minister of Transport has been talking of electricity a good deal in public lately in a somewhat similar confident way. The case for the widespread promulgation of genuine facts is beyond dispute, so that a halt may be called in order to examine the facts from

a national point of view, and not in the partial, incomplete, and unsatisfactory way which is at present being pursued in Government circles. The National Gas Council are moving. One thing we would strongly emphasize is that whatever is done the facts must be presented in a manner which can be popularly understood. In this respect, the clarity of Mr. Moon's data is a model for further and wider application.

Chemical Manufacturers and the Gas Industry.

There are two points about their Bill in Parliament upon which the Gas Light and Coke Company may be heartily congratulated. The measure proposes the largest individual amalgamation which has ever taken place in the gas industry, by the incorporation of the Brentford Gas Company in the gigantic premier undertaking. In the large area which will thus be created under the one gas-supply jurisdiction, there are numerous local authorities, who without doubt have given to the scheme the minutest scrutiny aided by expert advice, with the result that, although there were originally 35 petitioners against the Bill, none put in an appearance before the House of Commons Committee last week. The only opponents were the Alkali Manufacturers' Association, one of whose main ambitions in life is to shackle the gas industry as much as possible in order to serve their own ends and interests, instead of those of the millions of gas consumers of the country. The first matter for congratulation to the Gas Light and Coke Company therefore is the complete endorsement given by the numerous local authorities to the scheme of amalgamation. The second point for felicitation is that the Alkali Manufacturers' Association did not gain anything by their interference. If leading Counsel for the Company (Mr. H. P. Macmillan, K.C.) is correct in his surmise, it is necessary to look deeply beneath the surface to find the real reason why the Association were there at all; and the suggestion is that their move has on this occasion some connection with the Deuchar litigation, which seeks to prevent the Gas Light Company making caustic soda for the purpose of working-up their own secondary products. In that the chemical manufacturers have failed in the High Court and the Court of Appeal, and, pursuing the Company to the fullest extremes, they are now taking the case to the House of Lords. The idea was, if they could succeed in their desire before the Commons Committee, a useful advantage would have been obtained which would have helped them in the litigation.

The position is almost farcical. The Brentford Gas Company in their Gas Order of 1924 had the one-third residuals purchase clause placed upon them, with the usual proviso that they may "purchase from other gas undertakers and elsewhere, and use, the materials required to work up and convert the residual products so arising from their own manufacture of gas, or purchased as aforesaid;" but "shall not manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings or in the manufacture of which the use of residual products produced by the Brentford Company or purchased from other gas undertakings is merely subsidiary." This clause the Gas Light Company proposed should be repealed, on the ground that the Bill intended that the Brentford area of supply should come under the legislative code of the Gas Light Company, which Company have no power to purchase secondary products from other concerns, and they do not desire it. They have sufficient of their own. The chemical manufacturers wished to retain and not repeal something that the Gas Light Company do not want, even though the clause only applied to the Brentford area. This being so, there was a motive, which we think was fairly well revealed by the proceedings. To have retained the clause would have complicated matters; the object of the Bill being centralization and concentration, and not to make the conditions of working more complex in the interests of the chemical manufacturers. But it was very clear before the discussion ended that it was the proviso, and not the one-third restriction, which was the real objective of the opposition. In the view of the Governor of the Company (Mr. D. Milne Watson) if the proviso was placed upon the Company, it would deprive them of existing powers on the faith in which large sums of money have been expended; and, among other things, it would have the effect of preventing their manufacturing caustic soda for the working-up of their own residuals. The chemical manufacturers do not appear to have had the candour to acknowledge at the outset what was the exact object of their opposition; but, before the hearing concluded, their Counsel admitted that the proviso at the end of the clause was the thing that would handicap the Company. Truth will out; and so the surmise of Mr. Macmillan was correct. The Committee very properly sent the chemical manufacturers empty away. It is a singular thing that Parliament should ever allow any interference with the carrying on of gas undertakings to the best advantage in the public interests, in order to further the private interests of the chemical manufacturers. It is absurd to contend that the liberty enjoyed by them should not be allowed to gas companies as public utility concerns; inasmuch as the maximum economy and efficiency at which the latter can be worked is, through the sliding-scale, to the advantage of the public.

New Gas Producing Plant and Old Purification Methods.

The gas profession, as is well known, has been deeply indebted to a succession of occupants of the office of Chief Alkali Inspector and the members of their staff. The happy relations that have always existed between them and the chief technical officers of gas undertakings are due to the reciprocal feeling that both are out for the purpose of securing the highest efficiency in the operations which come under the surveillance of the Chief Inspector's Department, in view of the fact that, through such efficiency, the conditions can be fully preserved which it is the main function of the inspectors to see are duly observed. In such matters it is an excellent tradition of the Department that it is always better to realize the end by good understanding than by autocratic control or the application of compulsory method. The latter is only exercised when there is deliberate and flagrant evasion of conditions and regulations. It was a happy thought which led to the invitation to Dr. T. Lewis Bailey, the Chief Inspector of Alkali Works, and Mr. F. Napier Sutton to be present at the luncheon of the Southern District Association of Gas Engineers and Managers on Tuesday of last week. In the course of the after-luncheon proceedings, Dr. Bailey proposed the toast of the Association; and in doing so he made a suggestion which we think is worthy of consideration and investigation by gas engineers and chemists.

The work of the Chief Inspector has necessitated his studying gas making in its modern forms; and he says it has led him to the conclusion that gas engineers have been going ahead as fast as they could by altered and improved methods of making gas, but he is rather afraid that, in doing this, they have not considered to the extent they should have done the question of whether the new methods require any modification of the subsequent processes. Dr. Bailey's exact words were: "Gas engineers "have stuck their new methods of making gas on to their "old methods of cleaning it; but is this right? It is a sug-"gestion I throw out; and I think I am justified in doing "so. Is there not a vast field to be explored in the cleaning "of gas—that is, in the treatment of the gas after it comes "from the retorts, and before it leaves the works?" Now that the point has been raised, it has to be acknowledged that during the past decade the composition of gas as it passes from the retort-house in its crude state has been altered considerably with good economic effect, but not always, regarded chemically, in respect of the distribution plant and appliances. Further, the admission has to be made that there has been no definite and general investigation as to whether or not the condensing, washing, and other purification plant and processes are the best that could be devised for dealing with the gas of the present day. The only thing that can be said, apart from other chemical considerations, is that, within the limits of statutory decrees as to purity and quality of gas, testings are now carried out more rigorously than they were beforetimes, and that very little complaint is to-day heard of any infraction of the standards laid down. However, Dr.

Bailey's point is a good one, and deserves thorough investigation to ascertain the answer that should be given to his question, "Is this right?"

Smoke Abatement and Gas and Electricity.

The District Conferences of the "B.C.G.A." have started with a good swing at Leicester and Greenock. A sketch of the proceedings in the former town was given in our columns last week; and an account of the Greenock meeting appears to-day. One thing that particularly strikes us about these conferences is the immense enthusiasm that is shown in the work by the municipal authorities—especially by those owning both gas and electricity undertakings. There is no question that among them there is spreading a strong appreciation of the part they should and must take, to fulfil thoroughly their functions in fostering to the utmost atmospheric conditions which will promote the health of the community and, through enhanced cleanliness, the amenities of the cities and towns over which they have governmental jurisdiction. There is also an extending understanding of the potentialities and the limitations of the rival methods of accomplishing this work. Everything must be done to advance this knowledge; and it is clear from what Mr. F. W. Goodenough said at Leicester that this is one of the salient components to-day in the policy of the Association. The lines of the conferences so far held, and we take it the same will apply to those which are to follow, show this to be so. The knowledge is not confined to the members of municipal authorities; it is gaining ground among the public. But the public, regarded apart from their municipal representatives, look upon heating by gas more from the labour-saving and convenience points of view than from that of atmospheric purity. What is happening among the public is that never in the whole history of the gas industry has there been such a long continuity of high-level demand for gas appliances, and the result is seen in the universal report of a considerable demand for gas, notwithstanding industrial depression. This is going on despite the activity of the electrical people in urging the public to adopt electric cooking and heating.

There are two points in a speech made at the Leicester conference by our friend, Mr. Councillor George E. Hilton, the Chairman of the Corporation Gas Committee, to which we should like to make brief reference. He remarked that there was no doubt that legislation to speed-up smoke abatement was urgently required, though they would have to wait until next session before getting it. We agree as to the urgency, especially if the Bill that is passed empowers—as did the Bill which was on its journey when the late Government relinquished office—local authorities to make by-laws requiring new houses to be provided with cooking and heating arrangements of a non-smoke producing order. But there is no reason why municipal authorities should wait for legislation before actively engaging in work which will assist in bringing about a great reform. The second point is that "at present the annual home consumption of coal is in the neighbourhood of 180 million tons, and of this considerably more than three-quarters is burned in a raw state. When talking of smoke abatement, there is no need therefore to waste time in arguing the merits of gas and electricity. There is ample scope for both to make all the inroads they can upon the 75 p.ct. of the fuel consumption which consists in burning raw coal." In part we agree with Councillor Hilton; in part we do not. We are of opinion that, in the national interests, when talking of smoke abatement it is necessary to consider the merits of gas and electricity in order that a proper perspective may be obtained, and that the country may not be led into making provision for accomplishing a prodigal waste of fuel through the application of electricity to general heating, and thus incidentally rendering the country poorer than it is to-day. There is not ample scope, even in the cause of smoke abatement, for the utilization of more coal at a lower efficiency than now obtains by its use in other ways. The combined thermal losses in electricity generation and transmission are so great that for ordinary heating purposes electricity can never take the place of gas—all it can do is to indulge in a little pretence that it is doing something effective on the outskirts of the work. Moreover, for general heating (being a seasonal and not a continual requirement) it would necessitate provision in generating and transmission plant which would be idle for a large part of the year, and thus another uneconomy which would have to be borne by the electricity undertakings and the consumers—or perchance the ratepayers.

It is no use for the purpose of displaying in public an unprejudiced mind, or a diplomacy having for its object the protection of the feelings of our electrical friends, to indulge in the ignoring of facts, or in the concealment of knowledge. It is because this has been done in the past that misconceptions exist so extensively in the political mind. It is well to look the facts squarely in the face, and, having done so, to accept the position as it is found, and as it can be proved to be. That position is that the treatment of coal by the gas industry presents the largest economy to the nation of any suggested method of attacking the smoke problem; and no words can affect the truth of this. Everybody connected with the gas industry has (to use words culled from the paper of Mr. James Paterson, M.A., at the Leicester conference) "a great civic duty . . . . to lead the people of these islands to the realization of the glorious vision of clean towns and cities, and a healthy population revelling in the enjoyment of pure and unpolluted atmosphere."

Special Benevolent Fund Appeal.

The President of the Institution of Gas Engineers (Mr. J. Ferguson Bell) is making a special appeal on behalf of the Benevolent Fund. It is addressed to those members who so far are not subscribers, and to those who are for increased subscriptions. The Fund has proved of incalculable benefit to many of those unhappily left unprovided for; and, in addition, special grants are made to meet urgent cases of need. At a recent meeting of the Committee of Management of the Fund, fifteen grants were made, which will amount to £517 during the year. The total estimated expenditure will be about £600. The total of the subscriptions received from members last year was only £272, donations £90, and interest on investments £139—giving a total income of £501, so that unless members' subscriptions are increased this year by at least £100, it will be necessary to draw upon reserves, and grants in future will require to be curtailed. This the President knows is not the wish of the members. We trust the appeal will bear good fruit.

Permanent Summer Time.

The Summer Time Bill has been before a Standing Committee of the House of Commons. An unsuccessful attempt was made to alter the period in the measure—the first Sunday in April to the first Sunday in October—to the third Sunday in April and the third Sunday in September. It will be impossible for the Bill to affect the commencement of summer time this year; and therefore the Home Office will issue the customary Order, which will fix the date from the third Sunday in the month—April 19.

Virgin Soil.

Many gas shareholders will have received a well-printed prospectus, containing four pages of wording which is not worth the highly respectable paper on which it is printed. The style is excellent, the substance of the prospectus distinctly thin. The high-sounding title of the new venture is the Southern Counties Electric Light and Power Company, Ltd. The document bears the stamp of the National Scheme for Disabled Men, which term does not necessarily include disabled investors. It is to be a rich Company, with a capital of £46,000, and offices in London, Brighton, Eastbourne, Bournemouth, Exeter—the registered offices being in Bournemouth. All the places named are well supplied with electricity. The £46,000 is divided into 20,000 8½ p.ct. participating preference shares of £1 each, 20,000 ordinary shares of 1s. each, and 2500 first mortgage 7 p.ct. debentures of £10 each. The Company require at present merely a paltry £35,000, for carrying out a contract with the Electricity Finance and Distribution Company, Ltd., of 43, Cannon Street, to buy a plot of land for a generating station for £80 at Sturminster-Newton, to buy from Jenner & Simpson, of Battle, an elec-

tricity undertaking there for £2500, to purchase a piece of land and battery building at Battle for £400, the preliminary expenses due to the Electricity Finance and Distribution Company estimated at £1000, and administrative expenses and cash loans on account of contracts, &c., estimated at £1800, exclusive of legal charges. The preliminary and other expenses, estimated at £4000, amount to more than the sum to be paid for the Battle undertaking! By the way, the urban district of Battle is included in the Extension Order of the Hastings Corporation, now before the Electricity Commissioners. Another contract has been made with the Chagford and Devon Electric Light Company (one, we believe, of the 43, Cannon Street hatchings) to take from them electricity in bulk. If there are fools enough to supply the £35,000, the Company should have a good margin of spare cash. But we do not think that anybody who knows the history of these promotions will put money into such a flimsy affair as this. We see that the dear old Baronet has again been installed in the chair—Sir Charles B. H. Soame. He is on so many "Boards" now, and Chairman of so many, that he cannot have much leisure time. Mann, Martin, Bennett-Calvert, and Brigden are other names on the Board. W. Thompson, of 43, Cannon Street, again figures as the Solicitor, and C. A. Turner & Co. (whose reports as Auditors are consistently favourable to these ventures) have enlarged their clientele by the addition of this Company. Why is it that the name of Eaton does not appear so frequently on these documents in these times as it used to do in other days? Has it lost its magnetic power?

Economy of 20-Ton Wagons.

The economy of 20-ton wagons where they can be used has led to a further concession by the Great Western Railway to users at the South Wales ports. In addition to the rebate of 5 p.ct. allowed off the conveyance rates, the charge for tipping and weighing coal in fully loaded 20-ton wagons at the docks owned by the Company will be at the rate of 6d. a ton (instead of the ordinary charge of 7½d.)—a decided advantage in favour of the high-capacity wagon. It is reported that the use of the new wagons will be considerably extended during the present year.

Factory Legislation.

It is announced that the Home Secretary has definitely made up his mind that it will be impossible to introduce a Factory Bill this session; but appropriate legislation is under consideration, and will be placed before Parliament at a later period. It is stated that the Home Office view is that the factory legislation of the country is already the best in the world, and that for various reasons it would be inopportune at present to introduce a set of entirely fresh proposals. We are inclined to think the job is a bigger one than the Government are, in the present state of public affairs, willing to tackle.

Coal Mines' Inquiry.

The Joint Committee of coal owners and representatives of the Miners' Federation met nearly a fortnight ago, and had a long discussion on the vital questions of output per shift worked and the costs of production. Figures were laid before the Committee as to the cost of production in the English coalfields as compared with the cost in Germany and other Continental and American coalfields. The importance of the English figure approximating to those in competing coalfields was stressed, not only as regards the export trade, but in its effect upon other industries in which coal is a raw material. The Committee will meet again to-day and to-morrow. The representatives of the miners are proposing to criticize the amounts paid to general managers, managers, and secretarial staffs, which suggests that there are likely to be some lively passages.

Miners' Minimum Wages.

The House of Commons last Friday on sound grounds refused to give a second reading to the Bill promoted by the Miners' Federation to fix a minimum wage of 12s. per shift for miners. The House declined to establish a rigid minimum, which would withdraw from those directly concerned the power to settle their own affairs in consultation and conference on conditions prevailing at any given time. The House heard information as to the severe competition that British coal is to-day receiving from foreign produce; and the members also learned that, if the Bill was passed, it would raise the average cost of production by 2s. or 3s. per ton, and in some centres by 4s. and 5s.

PERSONAL.

Two officials of the Burnley Corporation Gas Department, Mr. A. B. Munro (Showroom Manager) and Mr. G. Langstreth (Assistant to the Gas Engineer), are leaving, the former having accepted a position as Sales Superintendent to the Edinburgh Corporation, and the latter going as Deputy Engineer to Todmorden. On Wednesday, March 25, Mr. J. H. Clegg, the Gas Engineer, presented each with a solid silver cigarette case, a pipe, and a pouch.

Mr. John Whitaker, Indoor Superintendent to the Bradford Corporation Gas Department, who retired on March 31 after 48 years' service, was presented on March 26 with a handsome silver cigar box and a cigarette case, the gifts of the members of the Gas Committee. Among those who spoke appreciatively of his work were Mr. George Walker, Chairman of the Gas Committee; Mr. J. H. Barraclough, ex-Chairman; and Mr. Charles Wood, Gas Engineer and General Manager. Mr. Whitaker is succeeded by Mr. J. W. Horwill, the newly-elected Hon. Secretary of the Yorkshire Junior Gas Association.

At a smoking concert in the dining hall of the Gas Light and Coke Company's Chief Office in Horseferry Road, on Tuesday of last week, a presentation was made to Mr. H. Dodimead, Chief Lamp Inspector, who retired on March 31. Mr. F. W. Goodenough (Controller of Gas Sales), in making the presentation, referred to the long and honourable service of nearly 46 years which Mr. Dodimead had rendered to the Company, during 21 years of which he had served under him as Chief Lamp Inspector. He referred to the fact that Mr. Dodimead expected to celebrate his Silver Wedding in the present year, and therefore the gifts that they were asking him to accept were particularly appropriate. They wished him and his wife good health in their retirement, so that they might have a chance of celebrating their Golden Wedding. Mr. Dodimead, in reply, expressed the sincere thanks of his wife and himself for the magnificent gifts. He also wished to thank, on his own behalf, the whole of the public lighting staff for their loyalty and devotion to duty during the years he had been at the head of that department. He could truly say that, thanks to this good service, the street lighting in the Company's district was second to none. The gifts comprised a solid silver coffee service and Wedgwood cups and saucers, from the workmen and staff of the department; a massive silver tray, from the office staff of the Company; a leather suit case, from the Local Managers and Inspectors-in-Charge; and a pair of silver candle-sticks for Mrs. Dodimead, from the workmen and staff.

OBITUARY.

Mr. J. Marshall Thomas, ex-Mayor of Penryn, Cornwall, died last Friday at the age of 75. As Chairman of the Penryn Gas Company, he performed valuable work in the borough.

The death of Mr. T. S. S. Gardner, of Kidderminster, at the age of 77 years, is announced. For many years he served on the Ledbury Urban District Council; and he was a Director of the Ledbury Gas Company, of which he was Secretary for about nine years.

Departure of the Prince for West Africa.

The following telegram was addressed to H.R.H. the Prince of Wales previous to his departure on Saturday last: "Institution of Gas Engineers send you loyal greetings praying that your tour may be as successful in promotion of world's good fellowship as previous tours. Wishing you God-speed. Ferguson Bell, President." A reply was received as follows: "Sincere thanks to the Institution for good wishes. Edward P." The Secretary, Mr. W. T. Dunn, represented the Institution at Victoria Station during the departure of His Royal Highness.

Gas at the Pit's Mouth.—Discussing low-temperature carbonization before the Franklin Institute, Dr. H. C. Porter remarked that proposals are often made, in connection with projected large-scale power development, or central station arrangement for gas, at the coal mines, to utilize some process whereby the coal is gasified completely, with a bye-product of tar and possibly ammonia. Duplex plants are possible, using low-temperature carbonizing retorts together with gas producers or water gas generators, or a single combination process. It is problematical whether such central gas-distributing stations, by the use of cheap coal and the saving of a certain amount of tar oils and ammonia, could thereby secure sufficient advantage to off-set the high cost of the gas-distributing mains and the carbonization plant investment.

HENRY EDWARD JONES.

1843—1925.

The gas industry has suffered a serious loss by the death of Mr. Henry Edward Jones, who passed away at his home, Marden Ash House, Ongar, Essex, on the afternoon of Tuesday, March 24. Mr. Jones had been out riding that morning, and after luncheon had attended to several matters in connection with his Magistracy. He was preparing to go for a walk when he felt unwell; and although medical assistance was quickly forthcoming, he passed peacefully away in the presence of his daughter, Miss Ethel Jones, with whom he conversed to within a few minutes of his death.

Mr. Jones was born in Chester City in April, 1843, and was therefore nearly 82 years of age. He was the second son of Robert Jones, an eminent gas engineer of his time, who moved to Worcester in 1844, Bath 1845, Wolverhampton in 1846, and London in 1853, when appointed Engineer to the Commercial Gas Company.

He was educated at the City of London School and Stepney Grammar School, leaving in December, 1858, after passing with Honours the Cambridge Higher Local Examination. In 1859 he was articled to Joseph Beattie, the Locomotive Engineer of the South-Western Railway, and on the completion of his articles in 1862 commenced his professional career at the Harlow Gas-Works, Essex. After working as a student in Dr. Medlock's laboratory, and gaining practical experience at Pontypridd and Toddington, he was appointed, when 20 years of age, Engineer to the Wandsworth Company in 1863. He held this position until October, 1869, when he was appointed Engineer to the Ratcliff Company; but in the meantime he had paid professional visits in an advisory capacity to the Lisbon and Oporto Gas-Works (1863), Athens (1865), and Spain (1866). He married in April, 1865, and lived at Wandsworth until 1870, when he moved to East London, in order to be closer to his work.

In December, 1875, the Ratcliff Company amalgamated with the Commercial Company, and Mr. Jones was made Joint Engineer with his father. The Poplar Works of that Company were commenced in 1876; and on the retirement of Robert Jones in 1880, his son became Chief Engineer.

In 1902 Mr. Jones retired from the Commercial Company, and was elected to the Board of Directors, and in the meantime had moved to Marden Ash House, Ongar, where he lived until his death. He lost his father in 1896, and his wife in 1901.

During the later years at the Commercial Company, he had built-up a large consulting practice, and was Consulting Engineer to Eastbourne, Watford, Margate, Canterbury, Faversham, Dublin, European, Bombay, Primitiva, Whitstable, Woking, Enfield, Bishop's Stortford, and other Gas Companies too numerous to mention. He was, both before and after his retirement from active management, in great demand in parliamentary matters, rating cases, arbitrations, and such like. His intimate knowledge of the design and construction of works, the practical side of gas manufacturing and purification, and his administrative ability rendered his services as expert witness of immense value.

In September, 1888, he visited Boston (U.S.A.) on professional matters; and he was in personal touch with gas affairs on the Continent, in India, and in South America. He was prominent in the various classic fights relating to such matters as sulphur restrictions, burner Bills, and other legislation promoted to relieve the industry from cumbersome and costly obligations. He was engaged on rating cases for the old East London Water Company, and the Metropolitan Water Board.

Between 1905 and 1910 he gradually relinquished his consulting practice at Palace Chambers, Bridge Street, Westminster, and gave more attention to administration from the Directors' table. At the time of his death he was Chairman of the Wandsworth, Wimbledon, and Epsom District Gas Company, the European Gas Company (owning eight works in the North of France), the Bombay Gas Company, the Uxbridge, Wycombe, and Maidenhead Gas Company, the Primitiva Gas Company of Buenos Aires, and the Loddon Gas Company, and was Deputy-Chairman of the Commercial Company.

Mr. Jones was for many years Chairman of the Gas Companies' Protection Association, and took an active interest in its proceedings. He was one of the prime movers in the formation of the National Gas Council, and was first President. He was included for election this year as an honorary member of that body.

For many years he had been a prominent member of the Institution of Civil Engineers, having been admitted Associate in 1869, and transferred to membership in 1875. He was for a long period a member of the Council, and finally reached, in 1917, what must be the summit of every engineer's ambition—the Presidency of that Institution. Previous to his election to the Council, he had read three papers before the Institution—on the "Construction of Gas-Works" in 1875, "Purification of Gas" in 1880, and "Modern Practice in Manufacture of Gas" in 1900. He received several notable awards from the Institution, among which were the Telford Premium, the Watt Medal, and the George Stephenson Medal.

He was also a member of the Institution of Mechanical Engineers, having been admitted in 1878; and he was connected with the Benevolent Fund of this body. He delivered before the Institution in 1916 the Hawksley Lecture; the subject chosen being "Gas Engineers of the Last Century."

The deceased was, of course, an old and valued member of our own Institution of Gas Engineers, of which he was President in 1903-04; and he contributed from time to time to the proceedings. He presented the London Medal to the Institution, to be awarded annually for the best paper presented on a "subject of practical interest to gas engineers." One of his latest acts before his death was to transfer sufficient stock in one of his Companies to maintain the income for the permanent annual presentation of this medal.

Mr. Jones always took a lively interest in the politics of gas, and was a frequent contributor to the Technical Press on the topics of the day. For many years he was a Governor of the East London College and a Justice of the Peace for the County of Essex. A great outdoor sportsman, his favourite occupations were riding and hunting; and he won many point-to-point races and other events on his own horses—the first, on Knight in April, 1885, when he won the Essex Consolation Cup. The last was in April, 1896, when he won the heavy point-to-point on Colonel; his age at that time being 53 years. He was a great reader, and his library at Marden Ash bears testimony to his interests in country pursuits, local history of various parts of the country, science, and travel.

Two sons pre-deceased him, but he leaves two sons and three daughters. Mr. Frank Jones, M.Inst.C.E., is the well-known gas director and administrator; while Mr. Stanley Jones, M.Inst.C.E., is the Chief Engineer of the Commercial Gas Company, and is on the Directorate of the Oriental, Uxbridge, and Burnham Companies. His three daughters are Mrs. Ransome, Miss Mabel Jones, and Miss Ethel Jones. The last-mentioned lived with him at Ongar.

THE FUNERAL.

Probably in recent years, certai ly not since the funeral of Sir George Livesey, have there assembled so many representing the varied interests of the gas industry as were present on Saturday at High Ongar, Essex, when the last solemn rites on the passing of the beloved doyen of the profession were observed. The occasion was a striking demonstration of the high regard and esteem which Mr. Jones had won from numerous friends by his sterling qualities and unquenchable enthusiasm in everything he undertook.

In addition to those associated with him in his life's work as a gas engineer, there were, of course, many others who knew him in his other activities. Notably his friends of the Essex Hunt attended, with their Secretary, to express their feelings of devotion to a staunch member and active supporter of the Hunt for a period of fifty years.

Among those of his engineering colleagues present were Dr. Charles Carpenter, C.B.E., President of the South Metropolitan Gas Company; Mr. J. Ferguson Bell, M.Inst.C.E. (President), Mr. Charles F. Botley, M.Inst.C.E. (Senior Vice-President), and Mr. Walter Dunn, M.I.Mech.E. (Secretary), of the Institution of Gas Engineers, of which Mr. Jones was President in the year 1903; Mr. Thomas Goulden, M.Inst.C.E., of the Gas Light and Coke Company; Mr. A. E. Broadberry, M.Inst.C.E., of the Tottenham District Light, Heat, and Power Company; Mr. Charles Hulme, of the Uxbridge, Maidenhead, Wycombe, and District Gas Company; Mr. Robert B. Anderson, of the Gas Companies' Protection Association; Mr. E. J. Fottrell, of the National Gas Council, of which Mr. Jones became the first President; Mr. Cyril M. Croft, of the Wandsworth, Wimbledon, and Epsom District Gas Company; Mr. Frank Bush, of the South Metropolitan Gas Company; Mr. George Evetts, M.Inst.C.E.; Mr. A. R. Burch, M.Inst.C.E., of the Bombay Gas Company; Mr. Robert Grant, J.P., of the Primitiva Gas Company; Mr. G. M. Gill, M.I.Mech.E.; and Mr. F. W. Cross, M.Inst.C.E.

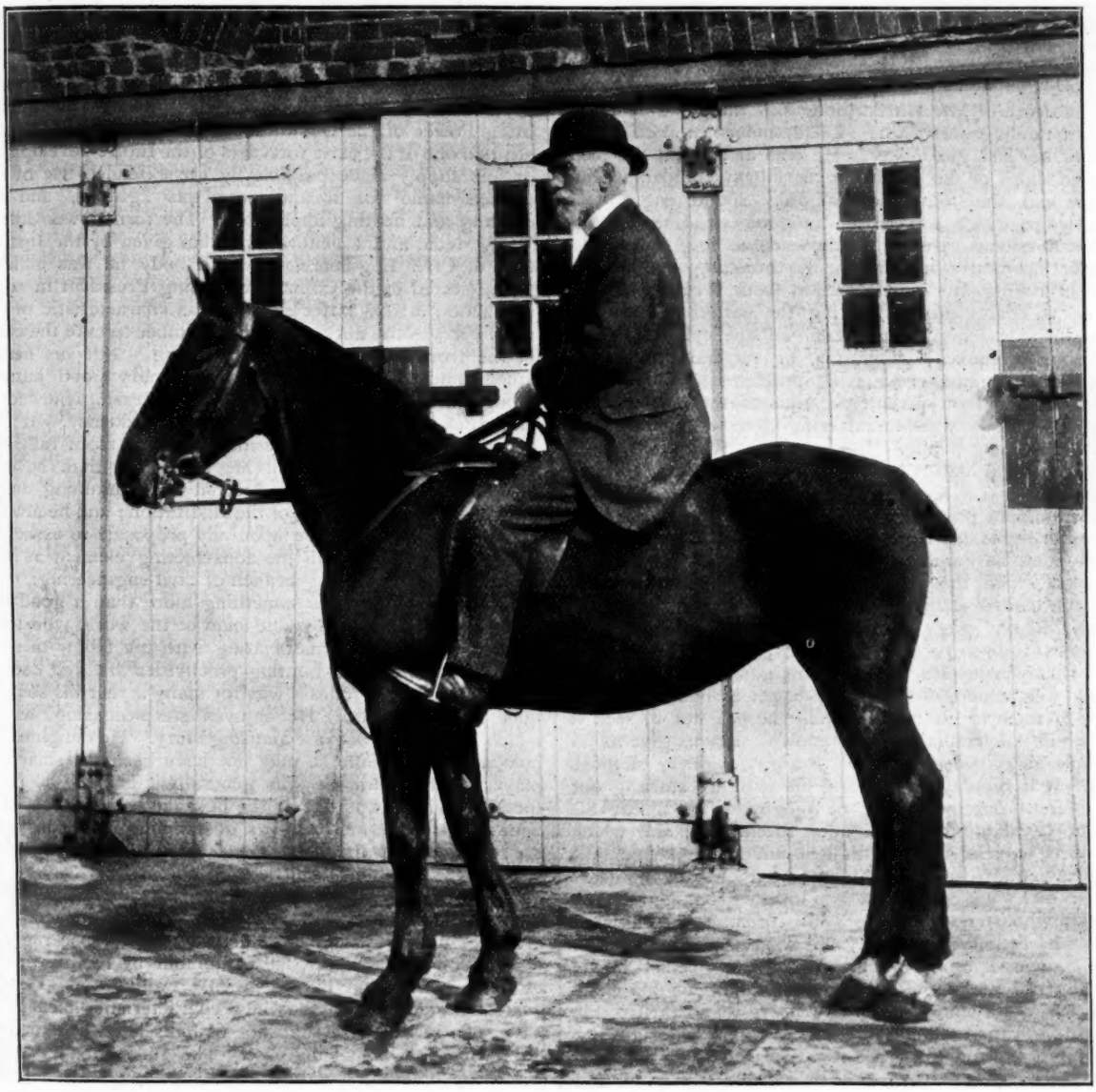
Lord Lambourne, P.C., Lord Lieutenant of Essex, and Lady Colvin, wife of the former M.P. for West Essex, were present, as also Mr. H. C. Honey, Director of Gas Administration, Board of Trade.

The funeral service took place in St. Mary's Church, High Ongar, and was impressively conducted by the Rector, the Rev. G. R. Nesbitt, M.A., assisted by Canon Reeve, of Standon. The music, which was rendered by the small village choir, was arresting in its simplicity. Boys of the local Wolf Cub Pack with their Cub Master formed a Guard of Honour. The chief

mourners were Mr. Frank H. Jones and Mr. Stanley H. Jones. Numerous beautiful floral tributes were sent, among others by the Institution of Gas Engineers, the National Gas Council, the British Commercial Gas Association, and the Gas Companies' Protection Association.

Simultaneously with the interment at Ongar a memorial service was held at the Savoy Chapel, and was attended by many friends, including Mr. Basil Mott, C.B., Mr. D. Milne Watson, Mr. Charles Hunt, Mr. R. W. Edwards, Mr. Honoratus Lloyd, K.C., Mr. W. J. Smith, and Mr. J. C. Walker.

Henry Edward Jones, born April 26, 1843, died March 24, 1925, has left us poorer by his passing from us; his memory will ever be held in affectionate remembrance.



THE LATE MR. H. E. JONES ON A FAVOURITE MOUNT.

APPRECIATIONS.

Mr. Basil Mott, C.B., President of the Institution of Civil Engineers.

I have learned with deep regret of the death of my old friend, Harry E. Jones, on March 24.

His works as a gas engineer are well known; and during the whole of his long association with this Institution, as a member of Council, and as President in 1917-18, he rendered great service to the profession. It is difficult to exaggerate the loss all members of Council will feel at the death of one whose advice was always most willingly given, and was most helpful.

He was a gentleman and a sportsman in the highest meaning of the words, whose cheerful and kindly friendship endeared him to all who had the privilege of knowing him.

Mr. D. Milne Watson, President of the National Gas Council.

When the news reached us of the death of Mr. Harry Jones, we looked at each other startled, incredulous. It was as if the familiar light of day had become dimmed, a dismal fog of depression had crept up, blotting out the bright sunshine.

We can ill spare him—our dear old friend—the brightness of his nature, the never-failing encouragement of his hopefulness, his humour, his delightful whimsical letters that always brought with them a breath of that wonderful spirit.

Even in his business correspondence, he would urge one on by such expressions as "Tally-ho!" "For'ard on"—borrowed from his favourite sport. He hunted almost to the end, and was riding on the day of his death. And he was 82 years old! To how many of us is given that power of keeping the boy in us alive under the weight

of years, the benumbing influence of disappointments, disillusions, and *atra cura*? He brought to the industry in his forceful personality that fearless truthfulness which, though as he himself expressed it, sometimes led him into "blazing indiscretions," yet inspired all who had the privilege of his friendship with the spirit of enthusiasm that he shed around him, and made the hardest and most monotonous efforts emphatically worth while.

We can only show our appreciation of his character by keeping alive that spirit, hard as it will be without his brave heart to rely on, or his hand to grasp.

Dr. Charles Carpenter, C.B.E., M.Inst.C.E.

The death of Mr. Harry Jones robs the gas industry of its outstanding personality—I had, indeed, almost added, and of the last gas-maker. He was articled in the locomotive shops of one of the great railway companies, and there laid the foundation of that sound engineering knowledge which served him in good stead throughout his professional career. In those days, too, there were master locomotive-builders busily thrashing out the details of rolling stock construction from "Flying Dutchmen" to coal wagons; fighting the battles of crank *v.* straight axles, and so inside *v.* outside cylinders; iron or copper fireboxes; chain, air, or vacuum brakes, not forgetting the gauges—burning problems in those days, and needing all the inventive genius of the technician to furnish solutions, while maintaining all the while the safety of the travelling public. To-day locomotives are built all over the world and by all nations on lines which are well understood and in which improvements are made in detail rather than in principle. The master locomotive-builder is no more—his day has passed. In the same sense Harry Jones must be numbered among the master gas-makers of an era which, too, will not return. Who to-day remembers the controversies centering round such questions as ground floor *v.* stage retort house; cast *v.* rolled girders; dips *v.* anti-dips; faced *v.* luted lids; dry *v.* wet purification? The principles concerned in gas manufacture are to-day well understood, and the engineer has the knowledge of them at his fingers' ends; he has not to seek it in the dim labyrinths of the unknown. Let us give as an example an episode in the life of a gas engineer of those days. It is Sunday and he and his wife are starting out for church—one perchance of the many the great Sir Christopher built for our London forefathers, and which they were wont to attend with little-failing regularity. "I must have a look at that troublesome hydraulic, my dear. You go on; I will soon catch you up." From standing at the retort-house door talking to his foreman, the engineer is little by little drawn inside, and soon proceeds to elaborate his investigations by climbing on the "beds" in his silk hat and Sunday clothes. Then taking off his coat, he turns up his white linen shirt sleeves, and thrusts his arm through the manhole into the hydraulic main, getting very tar-stained in the process. To-day it is known why mains and arch-pipes may become blocked with pitch and carbon, but the engineer of Harry Jones' day had to learn these things for himself, and dig out the underlying causes. A differently constituted London from the present lived and worked in those days when only the well-to-do had the luxury of a gas supply, and gas cookers were practically unknown. The engineer's great domain was then his works, and the chief inspector kept in order the district up to the consumers' meters, beyond which not a finger was lifted to help.

Our friend was but a young man when he left Wandsworth to join the Ratcliffe Company, which had a separate existence on the banks of the Thames at Wapping, near by which ran the famous "Highway," with a gasholder station somewhere about Shadwell alongside the railway to Blackwall—a line worked first by rope haulage and later by steam, though in its passage through dockland its track had to be roofed-over to protect the neighbouring goods from engine sparks. It is just fifty years now since the Ratcliffe Company was absorbed by the Commercial Gas Company, which then became the first London sliding-scale gas undertaking; and Harry Jones was appointed Engineer of the joint concern. I think this fusion constituted the tide in his affairs which led to Fortune. The application for the first time, at any rate in the Metropolis, of the germ of the principle that business profits should depend upon business skill, even in the management of a gas undertaking, undoubtedly provided the turning-point in his career; and to the golden rules until then in force were added "Keep down your capital expenditure," and "Keep low the price of gas." The influence of this new attitude upon works construction was far-reaching, for the advocate of economical construction of new plant, and of the intelligent use of old plant, carried these principles not only to the Commercial Works, but far and wide in the extensive general practice he built up as a Consulting Engineer. Of his many contributions to technical literature, I would single out for special notice "Jones on the 'Purification of Gas'" and "The Illuminating Power of the Gas of the Future." The latter constituted one of the early forecasts of the future development of gas supply made possible by the extended use of the bunsen flame for incandescent gas lighting, and for cooking and heating appliances. The former won him a Watt Medal and a Telford Premium given by the Institution of Civil Engineers, of which body he was in later years elected to the Council, becoming President in 1917. His action in this latter episode was characteristic of the man. It was the duty of another member to take the chair in the troublous times then prevailing. But his health failed, and Harry Jones, with customary good nature, though his own business had become increasingly arduous, undertook the responsibilities of the presidency. It can be truly stated that no President enjoyed more fully the respect and affection of all his colleagues than he did. His constant thought was directed to maintaining unimpaired the high traditions of the Institution; and he always looked with a jealous eye upon any proposals to associate too intimately therewith the constructing element as distinct from the designing branch of civil engineering.

But Harry Jones was something more than a good engineer. He was an all-round man of the world who took unceasing pleasure in associating with his fellow men in all walks of life. His hunting proclivities are well known to all. "Jumping Jones" was for many a year his soubriquet in his county. He enjoyed steeplechasing, as to which he told at least one amusing story. He delighted in polo also; and while he may not have been the smartest player of the team, he was generally the most reliable, for although he was one of the best judges of a bottle of wine that I have met, he was abstemious in the highest degree, and was therefore always "fit" when his associates were sometimes a little "off colour."

When he was considering having his portrait painted, I urged him to sit to Orpen. The conversations of the artistic Dubliner would have helped to get those rugged features on the canvas toned to humour by reminiscences of horse shows and Punchestown. Failing this, I suggested Mullings, for the only characteristic likeness I have seen of him is a snapshot of himself on a favourite horse, when he looks his best. The Institution portrait is, in my opinion, like most of its companions, a poor counterfeit of the real personage it purports to present.

I have said Harry Jones was an all-round man. He was; and therein lay his charm and the secret of his success. He was as much at home with a peer as with a policeman, a countess or a songstress, and he had the right word to say to each. One of my pleasant recollections is of him standing in a doorway in Rennes to catch a glimpse of the "divine Sarah," then on one of her last journeys to Belle-Ile-en-Mer. I think his happiest holidays, of later years at any rate, were spent in France, in which country he was ever ready to find delight in her cathedrals, her chateaux, her galleries, and with her people. Had he belonged to that country he would long ago have been enrolled in her Legion of Honour. Being British, and neither a self-seeking politician nor a greedy profiteer, he died as he lived, plain Harry Jones. After all, "Kind hearts are more than coronets," as Robertson told us long ago; and to those who knew him best his was kindly and genial to the full. He was by nature deeply loving and affectionate; and despite his great age, his death will leave a gap, not easily filled, in many places. That the people of Ongar were among those who loved him, was shown by the drawn blinds throughout the village on the funeral afternoon. But even yet more impressive

was the absolute stillness and silence in the church as the Vicar read the chosen chapter from St. Paul's Epistles—almost as though all hearts present were beating quietly lest they should disturb that of their brother so lately stopped. I shall miss Harry Jones; who among us will not?

Mr. J. Ferguson Bell, M.Inst.C.E., President of the Institution of Gas Engineers.

By the unexpected death of Mr. H. E. Jones, M.Inst.C.E., M.Inst.Mech.E., the gas profession has lost one of its most striking personalities. His long and distinguished career as an eminent engineer, accomplished administrator, and wise adviser, won for him an outstanding position in the gas world. He was held in high esteem by those more immediately connected with him, and justly recognized as an authority on the science and practice of the gas industry, and especially executive control—being a Director of several well-known companies. To his discernment and wise guidance, the Commercial and Wandsworth Gas Companies owe much of their success.

It was the intention of the Institution of Gas Engineers, of which he was President in 1903, to recognize, at the annual meeting to be held in June, his conspicuous services extending over many years, by electing him an honorary member. Alas! this was not to be. Instead, death removed one on whom years appeared to sit lightly—the doyen of the gas profession—to the profound sorrow of his many friends, as was manifest by the large and representative gathering at High Ongar Church last Saturday, to pay their last tribute of respect.

Mr. H. E. Jones was never afraid to express forcibly his views; and the active interest in the work of the gas industry was maintained in full vigour until the day of his death. He passed peacefully away at the end of his 82nd year—honoured for his untiring work on behalf of the industry which he had so much at heart.

He recognized the importance of progress; and to stimulate the activities of members to contribute to the transactions of the Institution, he recently provided sufficient funds for the award annually of the London Gold Medal for the best paper presented dealing with some subject of technical interest, and which will in future be known as the "H. E. Jones, London Gold Medal."

He was first Chairman of the National Gas Council and for many years Chairman of the Gas Companies' Protection Association, and Justice of the Peace for the County of Essex for over 50 years. He will assuredly be greatly missed.

Condolences are assured to his two sons (who happily are following with much success the profession of which their father was an honoured member) and three daughters. A happy background to a long and eventful life was his ceaseless devotion and affectionate regard for his family, fortunately still a characteristic of most famous men.

The Ravine Seam of the Lancashire Coalfield.

The survey papers of the Fuel Research Board form a series of papers on matters connected with the physical and chemical survey of the coal seams of Great Britain. Report No. 4 (published by H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, price 1s. 6d. net) describes laboratory experiments carried out by the Lancashire and Cheshire Coal Research Association on the Ravine seam of the Lancashire Coalfield, which is recognized over a large area, but has been worked only to a limited extent. The reasons for this are that the seam varies greatly in composition, and frequently becomes much split-up by dirt partings and bands of shale; also it shows marked tendencies to undergo spontaneous ignition in the goaf. It is a bituminous, caking coal, and is employed for gas-making, manufacturing, and household purposes. In certain areas, the ash and sulphur contents—especially the latter—are high for too easy utilization for gas manufacture. The composition and melting-point of the ash from different horizons in the seam may differ considerably. The ankerites in the Ravine seam undergo oxidation much more rapidly than is found to be the case in other seams examined. A series of tests showed that the coal could be greatly purified by washing. The fact that the seam is so variable in composition suggests that its utilization in the form of pulverized fuel may be of considerable importance.

ELECTRICITY SUPPLY MEMORANDA.

There seems to be some misconception on the part of at any rate the Hastings Corporation, if not other municipal authorities, as to the powers of the Electricity Commissioners to deal with national funds, or to make promises in regard to subsidies from them to maintain non-paying electricity schemes. Whatever the late Labour-Socialist Government may have committed themselves to in respect of subsidies has no binding effect upon the new Government. The present Government would not interfere with what their predecessors actually consummated, unless imperatively necessary in the national interests; but they cannot be bound to go farther with schemes in respect of subsidizing unless such commend themselves to them. Recently reference was made in the "Memoranda" to the fact that the Hastings Corporation were proposing to carry out a scheme of supply to outer villages and districts at a large cost. An estimate by the Electrical Engineer has shown that, if business develops in the outer areas as luxuriantly as he devoutly hopes it will, there will be a deficit of £1100 on the first year's working. The "if" is important. Electrical balance-sheet estimates often go astray—in the wrong direction; and we see nothing in the report of the Electrical Engineer in the way of a guarantee that the business he expects will be obtained, or that the calculated deficit will not be much more. It is all peculiarly vague; and it is on this that the Hastings ratepayers are asked through their councillors—be they wise or foolish—to shoulder a heavy expenditure. The ratepayers should look very closely into the matter. But there has been some attempt to placate any fears that may arise by telling them that any deficit will be made good out of the bountiful National Exchequer! In fact, in a note in a local paper, it was stated that there was a "definite understanding" that this would be so. Now does any sane man believe that the present Government would commit the taxpayers to an obligation to wipe-out all deficits that may arise, whatever their extent, in concerns over which the Government have no immediate administrative control? Mr. C. F. Botley, the Engineer and General Manager of the Hastings and St. Leonards Gas Company, wrote to the local paper pointing out that there could be no "definite understanding" of the kind, in view of the fact that the Government are still investigating the question, and have not yet determined upon any settled policy.

Electricity and National Money.

Mr. Botley is right; and we say this despite the assurance of the Town Clerk to the writer of the note in the local paper which gave publicity to the "definite understanding" hypothesis. A careful reading of what the Town Clerk had to say distinctly supports Mr. Botley's assertion. The Town Clerk is himself indefinite and vague on the subject. In the first place, he says it is not correct for Mr. Botley to say there can be no "definite understanding" as to any deficit. "There is," the Town Clerk adds, "a definite understanding between the Electricity Commissioners and the undertakers of electricity supplies in this country." The Town Clerk refers to a conference held last October, at which "it was stated that, with a view to the encouragement and development of electricity in rural areas, the Commissioners were prepared to make grants which would cover the loss of the undertakers on such rural schemes." The Electricity Commissioners have no power to vote the taxpayers' money away in this manner. They can only recommend. The Ministry of Transport and finally the Government stand between them and the parting with national money to make good deficits on the speculations of an industry run by local authorities and private enterprise. And October, 1924, is not March, 1925. We are rather surprised at the Town Clerk defending the "definite understanding" submission on such obviously shallow grounds. But he himself proceeds to show the insecurity of the "definite understanding" theory, and so supports Mr. Botley's contention that it cannot exist in a form to be "definite," or to have any reality, when he states that the new Government have been approached, and their reply was that their policy on the point has not yet been formulated. This being so, it would be interesting to have from the Town Clerk a positive interpretation of "definite understanding," and an indication of how it is he thinks the Electricity Commissioners have power to pledge the paying of money to liquidate losses on electricity speculation. If electricity, why not coal, gas, oil, water, and other things? There must be no preferential treatment by subsidizing any commodity (particularly a competitive one) in this country. We think that Hastings and its local officials should get from the present Government themselves a "definite" undertaking as to what they are prepared to do in the matter of wiping-off deficits on electricity speculation before making use of such a nebulous understanding as the one to which attention is here directed. We are strongly opposed to the subsidizing of indus-

The Indefinite Understanding.

tries by the Government; but if it is to be done in one industry, it should be applied to others.

Circulating Falsehood.

Give a lie a good start, and it is difficult to overtake it, unless those who do the circulation have sufficient good manners to acknowledge it when they know the truth. "Meteor" in the "Electrical Times" thinks he has found a nice tit-bit regarding the lighting of the offices of the Gas Department at the City Chambers of Glasgow; and he has been making energetic use of it. This is an example:

> Gas, says Mr. Goodenough, provides ventilation. That should be explained to the Glasgow Municipal Gas Department who complain so bitterly of bad air that a recommendation has been made to replace gas lights by electric throughout the municipal gas offices.

The best way to show how false is the statement that the Municipal Gas Department have "complained bitterly," and that it is through this a recommendation has been made to replace the gas lighting by electric lighting, is to give a history of the matter, which refers to the Surveyor's Section of the Department. Going back to the time when the section was housed on the first floor of the old City Chambers (up to June, 1923), the room was lit by electricity, and the ventilation provided (but not used) was similar to the system in the new City Chambers—*i.e.*, forced air currents actuated by fans in the turrets. The atmospheric conditions there (with electric light in use) were extremely unpleasant, arising from the smell of damp and drying clothing of men and stagnant air. The atmosphere was foul; and that was with electric light in use. In answer to appeals, information was given that it was impossible to use the fans provided because of complaints from the City Assessor that they caused a draught in his Department. Knowing that the Gas Department were to vacate the room within two years, the staff were asked to bear the conditions as best they could. In order to secure better arrangements in the new building, the architects were invited to pay particular attention to the matter. Assurance was given that the fans would be worked regularly, and that precautions had been taken to avoid inconvenience to the City Assessor's Department, which was to occupy rooms above the Gas Department in the new building as they did in the old one. For a considerable time after occupying the new premises, the fans were worked regularly, and the conditions were pleasant and in marked contrast to the old. Subsequently the fans were stopped; and there was again trouble. The result was that the General Manager of the Gas Department (Mr. John W. M'Lusky) wrote to the Town Clerk as to the inadequate ventilation of the survey room and the complaints counter in the Department. In his letter, he remarked: In the survey room from four o'clock onwards, there are upwards of 250 men employed, and the ventilation is most inadequate. We understand that this is on account of the fact that the fans are not in use, and we shall be glad if your Committee will give instructions that the fans be regularly in operation.

The Present Position.

The Municipal Buildings Committee remitted the matter to a Special Sub-Committee, to whom it was explained that the Gas Department had no complaint to make so long as the fans were running. But when 250 men came into the survey rooms (sometimes with wet clothing) the atmosphere became foul; and although the current of air provided by the heat from the gas lighting helped to some extent to clear the air, it was not designed to ventilate the room completely. The Sub-Committee subsequently recommended the removal of the gas-fittings in the Gas Department, and ignored the request that the means of ventilation provided at considerable cost should be used. The Department have submitted that, should this decision be ratified by the Corporation, it would not remove the cause for complaint, as it is not the products of gas combustion which are the cause (they naturally rise and find their way to the ducts provided at roof level), but it is the smell of the natural human excretions from lungs, skin, and clothing in a damp condition. Moreover, the Corporation, by ratification of such a proposal would give approval to the suggestion that gas lighting pollutes the atmosphere of buildings, which is entirely opposed to fact. It must also be remembered that quite 50 p.ct. of the business of the Glagow Corporation Gas Department depends upon gas lighting; and it would be damaging to have such a suggestion broadcast as the considered opinion and policy of the Corporation. The Department feel sure the Council will not deliberately be a party to such a suggestion. This history of the matter puts on it quite a different complexion from the one which "Meteor" of the "Electrical Times" has been so sedulously circulating.

EVENING STAR LODGE, No. 1719.

Installation Meeting.

The Installation Meeting of the Evening Star Lodge, No. 1719, was held in the Grand Temple of Freemasons' Hall on Wednesday last, the retiring W.M., W. Bro. Rae P. Normand, presiding at the commencement of the proceedings. There was an exceptionally numerous attendance of members and visiting brethren.

After the usual preliminary business had been transacted, the installation of W. Bro. Hermann L. Sheppard was carried out; W. Bro. Normand acting as Installing Master.

The installation of W. Bro. E. G. Smithard, P.M., P.P.G. Treas. (Norfolk), who had been duly elected as Treasurer, was deferred to a subsequent meeting on account of his absence through illness. The other officers were appointed and installed as follows:

W. Bro. Rae P. Normand	I.P.M.
Bro. Alfred H. Henry	S.W.
Bro. Fredk. G. Cockey	J.W.
W. Bro. H. W. Packham, P.M., P.P.G.D. (Surrey)	Chaplain.
W. Bro. Walter T. Dunn, P.M., L.R.	Secretary.
W. Bro. Frank West, P.M.	D.C.
W. Bro. A. L. Croager	S.D.
W. Bro. James W. Foreman	J.D.
Bro. John F. Simmance	Organist.
Bro. John A. Brentnall	I.G.
W. Bro. Reg. W. Foster, L.R.	Steward.
Bro. Albert B. Potterton	,,
Bro. Thomas F. C. Potterton	,,
W. Bro. R. H. Goddard	Tyler.

W. Bro. Thomas Cash, P.M., L.R., was elected an Honorary Member of the Lodge, on the nomination of the Standing Committee, in appreciation of his long and distinguished services to the Lodge and freemasonry generally. In returning thanks, W. Bro. Cash referred in feeling terms to several of the old members with whom he had been associated in the early days of the Lodge.

Bro. E. H. Swain, Engineer to the Metropolitan Gas Referees, was elected a Joining Member; and the following were proposed for initiation: Mr. Wilfred Baker Claridge, Engineer to the Marlborough Gas Company; Mr. James Waldron Swan, Assistant Manager and Secretary to the Hitchin Gas Company; and Mr. Leslie W. Dunn, Assistant Engineer on reconstruction of gas plant at the works of the Liverpool Gas Company.

At the dinner which followed, in the Connaught Rooms adjoining, W. Bro. Sheppard presided.

The toast of "The Worshipful Master," which was proposed in adequate terms by W. Bro. Normand, was responded to by W. Bro. Sheppard, who in turn submitted that of "The Installing Master," W. Bro. Normand.

W. Bro. Arthur Valon, P.M., L.R., gave the toast of "The Visiting Brethren" in an extremely interesting speech. It was responded to by W. Bro. James Bridge, W.M. of the Northern Star Lodge; W. Bro. Vale, S.W. of the Murdoch Lodge; W. Bro. John Ineson, of the Yarborough Lodge; and Bro. Leslie Rae.

The health of "The Past Masters and Officers of the Lodge" was appreciatively proposed by the W.M. W. Bro. Arthur E. Croager, P.M., replied for the former and Bro. Alfred H. Henry for the latter.

An excellent musical programme was provided, the numbers of which were interspersed with the toasts.

Emergency Meeting in June.

As in previous years, arrangements have been made by the Evening Star Lodge to enable those members of the Institution of Gas Engineers who are masons to meet some of their brethren in masonry in connection with the annual meeting of the Institution. The W.M. (W. Bro. Rae P. Normand), the M.E. (Bro. Hermann L. Sheppard), Wardens, and Brethren desire to invite all members of the Institution who are freemasons to attend. The Emergency Meeting for the purpose will take place on Monday, June 8, at 5.30 p.m., in the Grand Temple of Freemasons' Hall, Great Queen Street, W.C. After the Lodge, the brethren would be glad if their visitors would join them at dinner in the Grand Hall of the adjoining Connaught Rooms.

Cutting-off the Sunlight.—Executive heads of the American gas industry are, it is gathered from the "Intercolonial Gas Journal of Canada," waging warfare against the smoke nuisance. They say that an average person consumes about 6 lbs. of food and water a day. In addition to this, he takes into his lungs 32 lbs. of air each day. Vast sums of money are spent to insure unpolluted water and a pure food supply, it is argued, but up to this time little attention has been paid to a pure air supply. Yet every day we use 32 lbs. of air, against a total of 6 lbs. of food and water. The medical profession seems to be agreed that all pollution from soft coal smoke is responsible for many of the diseases they are trying to combat. The influence is both direct and indirect. Possibly the worst is the indirect effect of partially cutting-off the sunlight. This not only lowers the body's resistance, but has a depressing effect on an individual's outlook on life.

SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

ANNUAL GENERAL MEETING.

THE Annual General Meeting of the Association was held on Tuesday of last week, at the Hotel Cecil, Strand, W.C., under the Presidency of Mr. PHILIP G. G. MOON, F.C.S. (Engineer and General Manager of the Bournemouth Gas and Water Company), who delivered his address. There were other items of interest on the agenda; and previous to the meeting luncheon was served.

LUNCHEON.

The luncheon room was crowded, and those present included a number of distinguished guests. In addition to his Chairman (Mr. William Cash, F.C.A.), the President was supported by the following Directors of the Bournemouth Gas and Water Company: Sir Charles L. Morgan, C.B.E., M.Inst.C.E. (Deputy-Chairman), Sir Charles J. Jessel, Bart., and Lieut.-Col. Harold W. Woodall, C.I.E., M.Inst.C.E., together with the Secretary (Mr. Herbert A. Plumb, F.C.A.). There were also present the Vice-President of the Association (Mr. R. Robertson, of Bristol), the immediate Past-President (Mr. L. J. Langford, of Tunbridge Wells), Sir Arthur Duckham, Dr. T. Lewis Bailey (Chief Inspector of Alkali Works), and Mr. F. Napier Sutton. The Institution of Gas Engineers were represented by Mr. Walter Dunn, the British Commercial Gas Association by Mr. J. C. Walker, and the Gas Companies' Protection Association by Mr. F. E. Cooper. Mr. J. Ferguson Bell (the President of the Institution of Gas Engineers) was unfortunately unable to attend.

After the honouring of the Loyal Toast,

Mr. R. ROBERTSON proposed "Our Visitors;" remarking that they were fortunate in having with them that day guests who had rendered, were rendering, and he hoped would long continue to render, excellent service to the community, and particularly to the gas industry. Looking through the list which the Hon. Secretary had handed to him, he saw chief among them Mr. William Cash and Sir Charles Morgan (Chairman and Deputy-Chairman respectively of the Bournemouth Gas and Water Company), and also Sir Charles Jessel and Lieut.-Col. Woodall, their co-Directors. Whether or not Bournemouth had adopted a standard of qualification for Directors, it was evident that they had ways and means of securing Directors of the very highest class. In Mr. Cash they had a gentleman who was regarded as one of the foremost gas administrators and financial experts. In addition to being a Past-President of the Institute of Chartered Accountants, he had a very wide business connection with the gas industry. Like all other busy men, he was the very one who was always ready to help others; and he had given ungrudgingly of his time and his vast knowledge and experience, for the benefit of the gas industry generally. They all looked upon him as one of their most valuable assets. The other Directors were also men of wide experience in business and professional affairs, and men possessing reputations that they all envied. Sir Charles Morgan was the immediate Past-President of that most exclusive and aristocratic body, the Institution of Civil Engineers. Lieut.-Col. Woodall was a very old friend of the Association, and they were delighted to see him present that day as an honoured guest. It fell to the lot of few men, as it had done to him, to secure distinction in both military and civil life—and to have a retort called after him. It was a privilege to be able to count him among their honorary members. Among the other guests, they had with them Dr. Lewis Bailey, the Chief Alkali Inspector. They were proud to have him as their guest, and to give him an opportunity of studying the gas manager in more congenial circumstances than was sometimes the case. There was also Mr. Walter Dunn, the kindly and respected Secretary of the parent Institution, and others he would like to mention, but the time was passing.

Mr. WILLIAM CASH said that, though he felt his responsibility, it was a very great pleasure to be allowed to respond to the toast that had been so kindly proposed by the Vice-President. He would, in the first place, on behalf of himself, his co-Directors, and the other guests, like to thank the Association very much for having invited them to be there that day, and for the cordial reception of the toast. From what had been said, they would have gathered that, so far as the Directors of the Bournemouth Company were concerned, he was extremely fortunate in having with him a Board each member of which possessed special qualifications for administering such an undertaking. He would like to say how much the Directors appreciated the fact that the new President of the Association was their own Engineer, Mr. Moon. For Mr. Moon the Board felt the greatest admiration. They knew that the work he did for the Company was of the very highest character, and therefore that the Association had bestowed upon him a well-merited honour. As to the other guests, though sometimes the Chief Alkali Inspector might appear rather more of a "spectre" than an "inspector," he was very glad that Dr. Lewis Bailey had come along that day to meet gas engineers amid such pleasant surroundings. Then they had also with them Sir Arthur Duckham, who had had a very early association with Bournemouth. He had since gone a long way from it in many directions—especially in the work he did during the war, for which honour had been justly conferred upon him. He thought all company Chairmen would wish to express the debt they owed to the engineers and managers, who really carried on the work of the undertakings. From his own experience, he could bear testimony to the excellent service which these gentlemen rendered—to the advantage of the community and of the investors who put money into gas and water undertakings. Sometimes Boards called upon their officers to assist them, and at others they had to do, as Directors, what their officers told them to do. Sometimes "the boot was on the other leg," and Directors had to undertake duties which their officers ought to perform. That afternoon Mr. Moon really ought to have been at Westminster giving evidence which he was much more qualified to give than he (Mr. Cash) was.

AN INVITATION TO BOURNEMOUTH.

His association with the Bournemouth Company went back to 1891, when he was appointed Secretary. Subsequently he became a Director, and later on Chairman—a position which he greatly valued. He could therefore speak with some knowledge of the undertaking, which had developed tremendously under the management of Lieut.-Col. Woodall, and then of Mr. Moon. Of course, they were fortunate in supplying a town possessing such great advantages as Bournemouth could boast of; but even allowing for this, the increase in output of gas was remarkable. His reason for referring to this growth of business was that Mr. Moon was now engaged on the erection of a complete new gas-works of considerable capacity. The Company were spending something like £300,000; and following a practice of the Association in previous years, it was his pleasure to ask them to visit Bournemouth on some convenient date in May. The Company would be glad of an opportunity of showing them what was going on there, and more particularly what Mr. Moon was doing in the way of providing these new works. He extended to them a cordial invitation. [Applause.] Plans were also out for new showrooms and offices, though he did not think they would be erected by that time. The works, however, would be very well advanced, so as to reveal the plans Mr. Moon had drawn up and carried out—which reflected the greatest credit on him. They would see a works excellently well designed—not too ornamental, and at the same time not too obtrusively commercial—and largely built of reinforced concrete. If there was anything to be learned there, it would be at the disposal of the members.

POSITION OF ELECTRICITY.

Touching for a moment upon electricity, it would, of course, be known to them that they had been dealing at Westminster with the electricity supply of London, and it was interesting to note that the scheme put forward by the London County Council, and agreed to by the Electricity Companies, which had been the subject of discussion that week and in the preceding week before a Parliamentary Committee, brought into operation for the first time in the case of electricity the sliding-scale system with which they were so well acquainted in the gas world. A good deal had been seen in the Press on the subject of subsidizing electricity. So far as the gas industry was concerned, it did not ask for anything, provided it was treated on the same basis as its competitors. Sir Charles Morgan had handed him an extract from a speech by Mr. Woodhouse (the President of the Institution of Electrical Engineers), which put the position very fairly:

> "It would, in my view, be unsound to develop undertakings beyond the economic limit, either by penalizing existing consumers or by State aid, in that alternative services exist for most needs—*e.g.*, lighting by gas; power by self-contained plants, such as the petrol engine, the oil engine, and the steam turbine; heat by gas or coal; and so on."

If the gas industry was treated on these lines, there would be nothing to complain of.

The PRESIDENT thanked Mr. Cash on behalf of the Association for the invitation to visit Bournemouth, and for the kind remarks made concerning him (Mr. Moon). All he could say was that it would be a very poor engineer and general manager who could not be happy and make good under the admirable conditions existing at Bournemouth, and with such a Board of Directors as he had the honour to serve.

THE CHIEF ALKALI INSPECTOR.

Dr. T. LEWIS BAILEY, proposing "The Southern Association of Gas Engineers and Managers," said that gas engineers and managers he knew pretty well, but he had no special name for them. For himself, he had been called all sorts of funny things, and now he was termed a "spectre." Now, spectres had peculiar properties, but they were properties which he was not aware that he possessed. [Laughter.] He had had dealings with gas engineers and managers in all parts of the country—with their President and with their Vice-President—and those dealings had always been of the most satisfactory kind; their relationships had invariably been of the pleasantest. The Alkali Inspectors, as Civil Servants, had never desired to be hard on gas managers, and he hoped never would desire to be hard on them. Whatever they had wanted to be done, had been done in exactly the spirit that they wished—not at all from the point of view of compulsion, but from the point of view of two people working together. One did not like to go about insisting upon points of law; it was far preferable to work from the point of common-sense. Consequently one was always quite willing to discuss—and even to go further than discuss—questions which were not mere points of law. Thus it did happen that in many directions gas managers had worked with his Department to a very considerable extent. The gas managers had done a great deal for his Department, and in return

the Department had tried to do something for them. ["Hear, hear."] The members of that Association, he knew, were not men who simply did a job as a job. They took their work from the right point of view—not doing their business mechanically, but from the highest motives, seeking to make improvement where improvement was possible. Consequently they were always up against all sorts of problems, which they tackled with excellent results. The gas industry of to-day was not the gas industry of even ten years ago; it was a new thing altogether. There was a time when he thought he knew something about gas making; then there came a time when he thought he knew nothing about it.

NEW METHODS ON OLD METHODS.

Perhaps he might be permitted for a moment to refer to the question of dealing with effluents from sulphate of ammonia plants. This was a very big subject. It was practically simple until they got into touch with some of the more modern works. Then he discovered that he had to go back and learn gas-making again; and during the past few years he had been endeavouring to learn something of the modern methods of manufacturing coal gas. He must confess that it had been quite profitable; but it had led him to one conclusion, and he hoped they would forgive him for saying it. It had led him to the conclusion that gas engineers had been going ahead as fast as they could on altered and improved methods of making gas; but he was rather inclined to think that they had stuck there. They had stuck their new methods of making gas on to their old methods of cleaning it; but was this right? It was a suggestion he threw out; and he thought he was right in doing so. Was there not a vast field to be explored in the cleaning of the gas—that was, in the treatment of the gas after it came from the retorts, and before it left the works? Trouble had been experienced in many works in regard to the disposal of the ammonia effluents; and those ammonia effluents at the present day were much worse than they used to be. The point to make was this: Was it better to make a dirty material and clean it; or was it better not to make a dirty material, and then not to have to clean it? He imagined from what he had seen of late that it was possible to make a cleaner liquor, and so prevent any troubles which some of them might be up against. He threw out this suggestion for what it might be worth.

THE ASSOCIATION'S JUBILEE YEAR.

The President, responding, first thanked Dr. Bailey for his remarks, and those present for the cordial way in which they had received the toast. If every Government Department functioned in the way that the Alkali Department did, it would be a much happier country than was the case at present. [Applause.] He was sorry to disagree with his Chairman, but probably he only referred to a "spectre" by way of a joke. At any rate, he could assure him that the inspectors were by no means spectres to those who had charge of gas-works. The Alkali Inspectors were always most helpful, and cordially co-operated with the gas engineers in any of their difficulties—assisting them to overcome those difficulties, and so, by mutual work, to fulfil the letter of the law, which, of course, must be obeyed. As an Association they had this year attained the honourable and dignified age of fifty years, so that it was their jubilee year; and he thought he could claim that every one of these years had been a year of growth and of ripening experience. They had seen the gas industry grow in importance until now it ranked as one of the great public services of the country, which had done much to improve the amenities of life. The widespread use of gas for cooking, heating, lighting, and power had improved out of all recognition the atmospheric conditions of the towns, and had eased the labours of hundreds of thousands of harassed and over-worked housewives. The Legislature had wisely, but perhaps too vigorously, restricted their profits up to the point that no possible charge of profiteering could be brought against the industry; and this, coupled with the economies resulting from the improved methods which such Associations as theirs fostered and encouraged, had led to their being able to offer a very cheap, and therefore very popular, commodity. All this had resulted in the success of the industry being based upon sure foundations; and he did not think it was an industry which, under present conditions, was likely to be easily overturned, in spite of insidious dangers. He could not help feeling that too many of the leaders of the country at the present time, under the hypnotic influence of that potent phrase "super-electricity schemes," were seeing pictures of a new heaven and a new earth which had no foundation in actual fact. Super-electricity schemes would perhaps improve the efficiency of the generating stations from its average of possibly 8 p.ct. now to the 20 p.ct. the optimists claimed; but while this was good in itself, and while electricity had an increasingly important part to play in the country's welfare and development, he did suggest that this increase in efficiency was not enough to warrant all the exaggerated claims that were put forward for it by the people who were promoting these super-electricity schemes, that they were going to revive the industries of the country and put them on a successful basis. At any rate, he thought a very important duty devolved upon every one of the members of the Association, and of the industry up and down the country, to put before the public generally the fundamental facts of electricity generation and gas production, so as to show clearly the relative importance of the two industries in the country's fuel balance-sheet, and that no State aid should be provided for electricity. He repeated that the Association had a definite duty to inform the public of the true facts of the matter. Then they had also another duty—to see that, so far as they were concerned, their own industry was brought up to the highest state of efficiency. They must, if possible, get more per ton from their gas-making operations, and save anything that at the moment might be going to waste, until no higher point could be attained.

THE BUSINESS MEETING.

An adjournment was then made to another room, where the business meeting was held, with Mr. Philip G. G. Moon in the chair.

CONFIRMATION OF MINUTES.

On the proposition of the President, the minutes of the last meeting, as published in the "Journal," were taken as read, and confirmed.

ANNUAL REPORT.

The report for 1924, as circulated among the members, was also taken as read and adopted, on the motion of the President, seconded by Mr. Samuel Glover.

The report included the following items:

The General Committee, in presenting their report for 1924, feel that the period under review has been one of considerable success and importance. The continued growth of the Association and the excellence of the various papers submitted is most gratifying.

The Committee deeply regret having to record the death of the following members: Mr. Henry Morley, Teignmouth; Mr. W. D. Hunter, Rotherhithe; Mr. A. F. Phillips, Westminster; Mr. S. Temblett, Andover; and Mr. C. F. Franks, South Metropolitan Gas Company.

The total number of members is now 304, as compared with 291 at the end of 1923.

The audited accounts show that the receipts during the year were £305 18s., while the expenditure amounted to £287 18s. 10½d.—a credit balance of £17 19s. 1½d. remaining. The total funds of the Association on Dec. 31, 1924, were £75 17s. 1d.

FIFTH ANNUAL REPORT OF THE COMMITTEE OF THE EASTERN DISTRICT.

During the 1924 session, eight monthly meetings were held in London and one county meeting at Guildford. The average attendance of members at the meetings held in London was 28, and at the county meeting 34. Two joint meetings with the members of the Western Section of the Association were held—at Tunbridge Wells in May, and at Portsmouth in October. In each case the attendance of members exceeded the average; and much useful information was gathered from the subsequent visits to the gas-works in both towns. On these occasions very generous hospitality was extended to the members, who are indebted to the President of the Association, Mr. L. J. Langford, and Mrs. Langford, and also to the Chairman and Directors of the Portsmouth Gas Company, for their kind entertainment, which was highly appreciated.

The reports on commercial topics continue to be of great interest to the members at the monthly meetings; and the information which is available on these occasions regarding the state of the bye-product markets indicates that the time devoted to the discussion of these matters is most usefully employed.

Papers of a high standard were presented by members on technical subjects, which embraced interesting features in the processes of manufacture and the distribution of gas. Among the papers were included the following: "Use of Steam in Purification," "Sulphate of Ammonia Propaganda," "Modernizing Gas Cookers," "Competition from Coke-Oven Coke," and "Meter Repairs." The fruitful discussion which followed the reading of these papers showed that the introduction and discussion of technical subjects at the monthly meetings are appreciated by the members and useful to the industry. The scope of the question-box has been enlarged in order to meet the desire of several members who contemplate alteration or additions to their works; and the information so supplied concerns the efficiency and working of gas manufacturing apparatus and plant. Two interesting subjects were introduced through this source during the year: "Remodelling a Carburetted Water Gas Plant," and "Installing New Vertical Retorts."

The circulation of copies of the transactions of the monthly meetings continues to be of great value to the members, and the demand for copies is increasing.

It is a source of great regret to the Committee that the monthly meetings are not more widely attended. Out of a total membership of 249 for the Eastern Section, the average attendance of 28 is not very encouraging for the officers of the Association, who are responsible for organizing the meetings; and the Committee trust that the members will endeavour to promote a larger attendance at meetings in the future.

The following District Officers were elected to serve during the coming year:

Chairman—Mr. F. Smallbone.
Vice-Chairman—Mr. J. Terrace.

Committee—Messrs. A. H. Andrews, C. Valon Bennett, W. H. Bennett, A. Caddick, T. Carmichael, C. Chambers, A. G. Cheal, S. Lacey, L. J. Langford, R. H. Ruthven, C. H. Rutter, A. W. Sumner, J. S. Thorman, and W. H. Warren.

Two members to represent the Eastern District on the General Committee, in place of those retiring by rotation—Messrs. A. H. Andrews and W. H. Bennett.

Hon. Secretary—L. Trewby.

The total membership of the Section is 249, of which 117 are representative members, and 132 ordinary members.

A. H. Andrews, *Chairman.*

FIFTH ANNUAL REPORT OF THE COMMITTEE OF THE WESTERN DISTRICT.

During the year eight meetings have been held, seven at Exeter and one at Exmouth. The attendance at the meetings has been fairly satisfactory, but slightly below the average for 1923.

Most of the matters relevant to the general trend of the gas industry have been discussed, and members have, to a great extent, benefited by such discussions. The future of the Association in the West is well assured, as we have almost a 100 p.ct. membership; and though some meetings have produced small attendances, others have proved of such interest as to merit the presence of thirty mem-

bers, which is very satisfactory considering the distance some have to travel.

The following members were elected as District Officers to serve during the coming year:

Chairman—Mr. C. G. Dawson.

Vice-Chairman—Mr. J. H. Cornish.

Committee—Messrs. J. Armstrong, S. E. Halliwell, H. Higham, P. S. Hoyte, J. Harger Pye, H. E. Riley, J. Taylor, W. P. Tervet, E. P. Vince, and J. Wesley Whimster.

Hon. Secretary—W. E. Dean.

Representative on the General Committee, in place of Mr. R. Robertson (appointed Vice-President)—Mr. W. E. Dean.

In regard to the year 1925, everything points to a renewed interest in the affairs of the Association; and it is hoped that the members will support the meetings as regularly as before.

S. E. HALLIWELL, *Chairman*.

MR. W. H. BENNETT HONOURED.

Mr. L. J. LANGFORD (Tunbridge Wells) said that, on behalf of the Association, he was entrusted with the pleasing duty of thanking Mr. W. H. Bennett, of Redhill, for his devoted and most valuable services to the Association during the time he had been their Hon. Secretary. This was a privilege of which he was extremely proud. His only claim to it, however, was that he happened to be the last of the five fortunate Presidents to occupy the chair during Mr. Bennett's term of office; and though he felt the present President (or any of his own predecessors) would have made these acknowledgments more gracefully, he was too utterly selfish to waive his own thin claim. Members fully appreciated that much of the progress of the Association had been dependent upon the energy, ability, and resource of the Hon. Secretaries; and they wished to do honour that day to one who had given of his very best for the past five years in this capacity. It was no sinecure for any man to undertake the office five years ago. At that time engineers had much leeway to make-up on their works and districts consequent upon the war; and, looking back, one might well have imagined that this would have adversely affected the Association's interests. But what did they find to-day? He knew they would agree with him that the period had been a very critical one, and that the Association's activities were never more lively. The membership during that time had increased from 241 to 304, or 26 p.ct.; and they heartily congratulated Mr. Bennett on the realization of his ambition in this important matter. He asked for the 300, and he got them; so that they saw their Association the largest of the Senior Associations—a fact of which they were justly proud. There was a wealth of truth in the old saying: "If you want a job done, and done well, get a busy man to do it." This had been amply demonstrated in the present case; and he sometimes thought their friend's spirit asked too much of his physical powers. They knew his activities were many, and his enthusiasm boundless for any matter in which he interested himself; and his indefatigable work for their Association in particular, together with his unfailing kindness and courtesy, would long be remembered by every one of them. Mr. Bennett's popularity was not confined to their Association, but extended to the sister Associations; for he had freely given of his time to visit those in the North, the East, the West, and the Midlands. They all desired not only to thank him, but to express their appreciation of his services in practical form. The letters he (Mr. Langford) had received in response to the circular issued on behalf of the Committee bore eloquent testimony to the esteem in which he was held by the members; and the proposal to elect him an honorary member of the Association, for which he had so successfully and unselfishly laboured, was heartily endorsed. He therefore had the greatest pleasure in moving that Mr. W. H. Bennett be elected an honorary member of the Association.

Mr. W. N. WESTLAKE (Exeter) remarked that he had probably only one qualification for seconding this resolution—namely, that of representing to some extent the Western Section of the Association. It would be within the recollection of most of those present that Mr. Bennett took charge of the Association as Hon. Secretary a short time after it was reorganized, and it was just a question then as to whether or not the re-organization would be a failure; but with such an energetic Hon. Secretary as Mr. Bennett, he did not suppose one of them felt any real doubt on the matter. And they were justified in their faith, for success had come. It had enabled the Association to enlarge its usefulness to the industry, and much of this enlargement was due to the work Mr. Bennett had put into it. He would like especially to say how very much the Western Section appreciated the help he had given them. On many occasions he had taken the trouble and spared the time to journey down and attend the meetings.

The resolution having been passed with acclamation,

Mr. LANGFORD said: Mr. Bennett, we are under a great debt of gratitude to you; and in thanking you most heartily for your devoted services to this Association, we ask you to accept honorary membership, and also these field glasses and cigarette case, which we trust you will find of service and will be to you mementoes of this occasion. They are small tokens, not only of our deep gratitude, but of our personal affection and esteem. May the future hold for you all you so richly deserve. May you live long and enjoy good health; and may the Southern Association have the advantages of your active support for many years to come.

[The cigarette case was gold, with a monogram in platinum.]

Mr. W. H. BENNETT (Redhill) said he found difficulty in adequately thanking them for the great honour they had done him in making him an honorary member of the Association, and also for the valuable gifts. It was fortunate, perhaps, that he was not called upon to decide which appealed to him most; but he was sure they would not misunderstand him when he said that nothing they could give him would afford him so much pleasure as having bestowed upon him the freedom of the largest District Association. As they had heard, this was the jubilee year of the Association; and during these fifty years only some half-dozen of the members had been placed upon the Roll of Honour. Of these only three were on the list that day, and they were men who had done great service, not only to the Association, but to the industry as a whole. They could realize, therefore, how greatly he appreciated the honour that had been done him—particularly as he was the only one to receive this honour while still in active service. As to the handsome and useful gifts, no better choice could possibly have been made. He would always regard them as tangible proofs of the goodwill of the members; and when using them, as he hoped to do for many years to come, he would reflect on the many kindnesses he had received at their hands during the past five years. What he had done in this period had fallen far short of the ideals he had set before himself; and any success that had been attained was attributable to the encouragement and support received from the members. His thanks were due to his confidential clerk, Mr. Alfred Gear, who had done a lot of work, with entire satisfaction to him (Mr. Bennett) and the Association. Mr. Ernest Scears, the Engineer to the Company, had also on more than one occasion lent valuable help, for which he thanked him.

THE LATE MR. A. F. BROWNE.

The PRESIDENT said that, as they were no doubt all aware, unfortunately since the last meeting they had lost one of their oldest and most esteemed members in Mr. A. F. Browne. Members would be glad to know that a wreath was sent on behalf of the Association, and that the Association were represented at the funeral by Mr. A. H. Andrews. He was sure those present would like to pay a tribute to the memory of their departed friend.

This the members did by standing silently in their places.

NEW MEMBERS.

The Hon. SECRETARY (Mr. H. C. Smith, of Tottenham) read the following list of names of new members, who were elected on the proposition of the PRESIDENT, seconded by Mr. R. ROBERTSON (Bristol):

Mr. Frederick James Falkner, Manager and Secretary to the Romsey Gas and Coke Company, Ltd.

Mr. Henry Cecil Ratcliffe, Assistant Engineer and Chemist, Romsey Gas Company.

Mr. John Alfred Brentnall, Engineer to the Northfleet and Greenhithe Gas Company.

Mr. Douglas Forbes Irving, Engineer and Manager to the Leatherhead Gas Company.

Mr. Roy Forbes Irving, Works Superintendent, Poole, and Assistant Engineer to the Bournemouth Gas and Water Company.

REPRESENTATIVE ON THE INSTITUTION COUNCIL

Mr. P. S. HOYTE (Plymouth) proposed that the President be elected the representative of the Association on the Council of the Institution of Gas Engineers for the current year. Why had they waited, as an Association and as an industry, until now before electing a man occupying the position Mr. Moon did, with one of the most progressive undertakings of the country, to take his seat for the first time on the Institution Council? Probably the explanation was that Mr. Moon had not yet had the time to take that position in the affairs of the industry as a whole which they hoped in future he would find opportunity to occupy. The Bournemouth Gas and Water Company were developing at an extraordinary rate—almost unprecedented, he would say, for an undertaking of that size, in the history of the industry—and Mr. Moon's energies must have been absorbed by this development.

Mr. J. WESLEY WHIMSTER (Bath) seconded the resolution, which was agreed to.

PRESENTATION TO THE IMMEDIATE PAST-PRESIDENT.

The PRESIDENT said it was now his pleasant duty, on behalf of the members, to thank their immediate Past-President, Mr. Langford, for the excellent way in which he had conducted the affairs of the Association during the past year. It had been one of the most successful years in the history of the Association—due partly to the cheery good-fellowship of Mr. Langford, and partly to the quality of the programme he had provided for them. ["Hear, hear."] They all remembered, too, the

very pleasant visit they paid to his charming town and works, and the hospitality enjoyed at the hands of his Directors; and they had also in mind the additional visit paid to the Portsea Island Works—a visit which, thanks to the hospitality of the Directors and the excellent works that Mr. Carmichael had to show them, marked a red-letter day in the history of the Association. Mr. Langford had worthily upheld the high traditions of the office, and he had the privilege of presenting to him a suitably engraved silver salver as a memento of his year as President. [Applause.] They all felt that he heartily deserved it, and hoped it would serve to remind him of a very pleasant year of office.

Mr. LANGFORD, returning thanks, said he was indeed grateful for the nice things that had been said about him. He could only tell them that he was inexpressibly proud to have occupied the presidential chair of the Association. Any success that had attended his efforts was due to the support so generously accorded him. He sincerely thanked the President, Committee, and members for this support—and especially those who came forward so willingly with papers. The salver so kindly presented to him would, as long as he lived, be one of his most cherished possessions, and bring back to him memories of a very happy year of office and of the host of friends he had made during that year.

Mr. MOON then proceeded to deliver his Presidential Address, which was in two parts. The second part was a description of the new gas-works of the Bournemouth Company at Pitwines, which the members will inspect later. [This description will be included in next week's issue.]

PRESIDENTIAL ADDRESS.

My first duty must be to thank the members of the Southern Association of Gas Engineers and Managers for the honour they have done me in electing me to the responsible position of their President for the ensuing year. The position has been filled by so many distinguished gas engineers in the past that the task of adequately upholding the dignity and traditions of the office is one which may well cause the average man much

THE PRESIDENT.

Mr. P. G. G. Moon, F.C.S., of Bournemouth.

anxious consideration. Fortunately for my peace of mind, I have great faith in the kindliness and the capacity for making allowances of the members of this Association; and so I am content to do my best and leave myself in their hands.

One of your former Presidents—I think it was Mr. Campbell—referred to the fact that most members regard a Presidential Address as a somewhat uninteresting proposition. I am inclined to agree—especially on this occasion—although in his own case Mr. Campbell proceeded to demolish his contention by giving an exceedingly interesting address. I think that the feeling—which undoubtedly exists—probably arises from the fact that no discussion of the subject-matter of the address is permissible. Subject to your approval, therefore, in order to overcome to some extent these objections, I propose to divide my remarks into two parts—one a short Presidential Address proper; the other a paper dealing with the new gas-works of the Bournemouth Gas and Water Company at Poole, which you will, I hope, see during your visit to Bournemouth. At the same time, I should like to voice my personal view that, even if it breaks an unwritten law, it would usually be a distinct advantage to the industry to open the subject-matter of all Presidential Addresses to discussion.

GAS SALES PROGRESS.

It must be a source of considerable satisfaction to every gas engineer to see the extraordinary progress that is being made in the sales of gas throughout the country. Even those of us who have most consistently sung the praises and possibilities of gas, must be surprised and gratified at the progress it is making. The shortage of household labour—the improvement in the design of gas apparatus—the increasing desire to mitigate the "smoke nuisance" in towns, coupled with the excellent work of the "B.C.G.A." in bringing the advantages of gas before the householders of the country in a dignified and convincing way, have all resulted in a wonderful wave of popularity for gas.

The figures for Bournemouth of the gas made and the consumption per consumer for the years 1904, 1914, and 1924 are given below:

Year.	Gas Made. Millions.	Gas Sold.					
		Slots.		Ordinary.		Total.	
		Consumers.	Consumption.	Consumers.	Consumption.	Consumers.	Consumption.
1904	572·089	7,064	13,420	7,085	59,670	14,149	37,280
1914	1114·807	16,320	16,180	12,179	61,810	28,499	35,650
1924	1971·039	17,967	29,880	18,395	68,200	36,362	49,260

The satisfactory thing about these figures is the consistent increase in the consumption per consumer, as well as in the number of consumers. As some indication of the reasons for this steadily-increasing consumption, figures are given in the following table for the sales of gas apparatus in the Bournemouth area of supply for the past few years, as well as the summary of houses under construction during 1924.

Year.	Total Sales.	Cookers.	Fires.	Water Heaters.
	£			
1921	29,099	828	1570	243
1922	33,920	1150	2332	364
1923	42,956	1397	2944	523
1924	48,321	1743	3419	799

Summary of Houses Under Construction, 1924.

Number of Houses Started During Year.	Number Completed During Year.	Number Incomplete.	Piped Only.	Wired Only.	Piped and Wired.	Houses Already Occupied.
1495	1196 (including 296 started in 1923)	595	593	1	602	1042
			1196			

Points	Cookers.	Lights.	Fires.	Boilers.
	1220	5196	2552	293

Bournemouth is, I know, a particularly favoured town, but figures of a similar character could no doubt be quoted by practically all our members. It is, I think, safe to claim that the "right atmosphere" has certainly been created throughout the country for increased gas sales; and given the necessary propaganda work on the part of an undertaking, an adequate response by the consumers is to-day fairly certain.

GAS, ELECTRICITY, AND POLITICS.

Much is read at every election, and in the election programmes of every party, of the wonderful results that are to accrue to the nation as the outcome of the super-electricity schemes put forward as planks in the various political platforms. Our brilliant, useful, but very extravagant (from a thermal efficiency point of view) younger brother receives all the attention; and in spite of an excellent Fuel Research Board, who can provide all the scientific facts for those who care to ask for them, none of the leading politicians seems to realize that the elder brother, gas, occupies a far more important place in the political economy of the country's fuel supply.

They appear to be quite unaware of the fact that, not only is the gas supply of the country very much larger, but it is also much more efficient from a thermal efficiency point of view, than the electrical supply. If they fully grasped the underlying thermal facts, they would realize that the greatest good to the nation would probably come by putting the two brothers into business together. Each fills an important place in the country's needs, and by working together the greatest efficiency of the dual operations would be most readily obtained.

Consider the figures for the electric supply undertakings for 1923 (the latest figures available at the time of writing):

Stations.	Fuel in Tons.	Units Generated. Millions.	Equivalent Therms. Millions. (Elec. Unit = 3410 B.Th.U.)	Average Coal Consumption per Unit. Lbs.	Lowest Coal Consumption per Unit. Lbs.	Highest Thermal Efficiency. P.Ct.
463	7,356,757	4955	169·4	3·32	1·70	17·7

Now contrast these with the yield from the same weight of gas coal carbonized in a modern gas-works:

Coal Carbonized. Tons.	Gas at 70 Therms per Ton. Mills. of Therms.	Coke at 10 Cwt. Made for Sale.	Tar at 10 Galls. per Ton. Gallons.	Sulphate at 20 Lbs. per Ton. Tons.
7,356,757	515	3,678,000 tons at cal. value of 12,000 B.Th.U. per lb., 989 million therms	73,000,000	65,685
	1504 million therms			

Comment as to the increased thermal yield is superfluous—the figures are sufficiently striking to speak for themselves. In addition, there is the splendid yield of tar and sulphate to put to the credit of the gas balance-sheet.

The average efficiency of the electric supply undertakings is just over 8 p.ct. The most optimistic claims of the super-station are in the region of 20 p.ct.; and if these claims could be realized throughout the country, the equivalent thermal output of electricity from the same tonnage of fuel would be 425 million therms. But gas on the same tonnage, under *present conditions,* gives 515 million therms—apart from the 989 million therms in the coke and immense quantities of valuable residuals! The coke from the above gas balance-sheet, if turned into producer gas and used for the generation of electricity, would generate 2747 million units of electricity. The moral is obvious!

For the purpose of comparison, it is interesting to note the figures for the Gas Light and Coke Company for the same year—1923:

Year.	Gas Sent Out in Million C.Ft.	Calorific Value.	Equivalent Total Therms per Annum in Millions.
1923	36,570	500 B.Th.U.	182·8

As Mr. Milne Watson has pointed out, that Company alone sent out a greater number of heat units than the heat equivalents of the electricity sent out by all the electricity undertakings of Great Britain in the same year. The gas sent out during 1923 by the gas industry as a whole was as follows:

Year.	Gas Sent Out in Million C.Ft.	Average Calorific Value, say	Equivalent Total Therms per Annum in Millions.
1923	259,849	475 B.Th.U.	1234

Coal used	16,460,632 tons.
Coke made for sale—	
Net	8,197,347 tons, approx.
Equal to	2,200 million therms.
Tar	181,962,574 gallons.
Sulphate of ammonia . . .	117,166 tons.

The electrical industry is, perhaps, not so efficiently organized for commercial sales operations as the gas industry. I do not think they have any organization doing nearly such effective work in such an excellent way as the British Commercial Gas Association; but they do appear to be able to get the political ear of the country in a far more definite way than does the gas industry.

Mr. Milne Watson in his remarks as Governor at the recent annual meeting of the Gas Light and Coke Company, Sir Dugald Clerk in his classic paper before the Society of Arts in 1919, Mr. Reginald Clarry in the House of Commons, Sir Arthur Duckham on many occasions, and Col. Woodall and Mr. Seabrook in their work on the combination of gas and electricity undertakings—have all in various ways drawn attention to the vital issues involved.

What is required, however, is a co-ordinated effort; and I think the time is over-ripe for the formation of a permanent Committee drawn from the leading administrators, engineers, scientists, and publicists of the industry, whose definite duty it should be to impress upon the country by means of lectures by eminent scientists, by newspaper articles and pamphlets, and by representations to all political parties, the fundamental thermal facts of gas manufacture and electricity generation, and their effect upon the nation's fuel resources.* I hope my remarks will not be interpreted as in any way belittling the great and growing importance of electricity and the part it plays in the home and industrial life of the nation.

Of the importance of electricity, and of the good that must come from a cheap and abundant supply, there can be no question. The important thing is to see that the thermal value of the coal which is the prime source of our nation's power is conserved to the uttermost, and that the thermal efficiency of every major operation of which it forms part is carefully investigated. From such a standpoint as this, not electricity, but the present methods of generating electricity, stand condemned.

Improved Methods and Research Work.

The preferential position occupied by gas suggested by my previous remarks must not lull us into a false sense of security. It should, on the contrary, imbue us with an increased sense of the industry's responsibility. The need for research work to the end that our methods may be improved was never greater than it is to-day. The problems that confront us are not those of the engineer and manager alone; they become more and more the direct concern of the physicist and chemist; and we should all do what we can to encourage research work on the small scale on our own works, and on the wider scale in those Universities, such as Leeds, which specialize in gas problems.

PURIFICATION.

The purification of gas, involving principally the removal of sulphur and ammonia, is, broadly, to-day what it was twenty years or more ago. We are still content to remove the sulphur by means of oxide of iron, sell the spent oxide to the acid maker, and buy back from him sulphuric acid to use in the manufacture of sulphate of ammonia. I say we are still content to do this—that, perhaps, is not quite correct. We do it because no alternative method is available. It is an expensive and wasteful business, enriching the railway companies and the acid manufacturers at the expense of our consumers.

Any research that will teach us how to utilize the sulphur in our gas by direct application, will benefit the gas industry greatly.

BURKHEISER PROCESS.

It is worth reminding members shortly of the work done in this direction before the war by Herr Burkheiser. In his process, which was working satisfactorily on a stream of ¾ million c.ft. of coal gas per day at the Tegel Works in Berlin, the crude gas, after the extraction of tar, and while still containing both sulphuretted hydrogen and ammonia, was passed through a series of comparatively small purifiers containing dried nodules of oxide of iron about the size of peas. The sulphur was extracted, and the gas containing ammonia was passed first through a wrought-iron saturator, and then through a vertical scrubber containing a solution of sulphur dioxide.

The sulphur dioxide solution came from another scrubber, through which passed the air and sulphur dioxide from the particular purifiers undergoing regeneration. The regeneration of the purifiers was conducted *in situ* in a stream of air at a controlled rate, which raised the temperature sufficiently to fire the freed sulphur and burn it to sulphur dioxide, but not so high as to dehydrate completely the oxide of iron. The critical temperature was found to be approximately 600° C. After regeneration the oxide was extremely active; and for the several months that the plant was working, no serious loss of activity was observed.

The absorbing liquor was circulated continually, first through the sulphur dioxide scrubber, where it became acid, then through the ammonia scrubber, where the ammonia predominated until it reached saturation point and crystals of ammonium sulphite—$(NH_4)_2SO_3$—were thrown down in the wrought-iron saturator placed between the two scrubbers. The ammonium sulphite oxidized upon exposure to the air to a stable salt composed approximately of two-thirds sulphate and one-third sulphite. This compound was richer in nitrogen than "straight" sulphate, and experiments proved it to be in all respects equal to sulphate in proportion to its nitrogen content.

This process was particularly attractive, in that it reduced the size of oxide purifiers to about one-twentieth of the ordinary size, utilized the sulphur direct, and did away with the need for expensive ammonia stills and lead saturators. Many tons of salt were made in Berlin, and some at Bournemouth, by this process. Chemically the process was without flaw, and the gas routine gave no trouble; yet it broke down principally on account of the difficulty of securing oxide nodules that would stand-up to the changes of temperature. They tended to break-down ultimately to dust, which gave excessive back-pressure, and led to irregular fouling and regeneration.

Many experiments were made without success to produce oxide impregnated materials that would permit the chemical process to take place, and yet not disintegrate under the heat. The process, however, was so promising that it really seems that further research is well worth while, and might lead to a more successful result.

CURPHEY'S PROCESS.

Another attempt to utilize the underlying principles of the Burkheiser process was made by Mr. Curphey (when Chief Alkali Inspector) and Mr. Linder. In a suitable furnace they burnt the sulphur in spent oxide fouled in the ordinary oxide purifiers, and passed the resultant sulphur dioxide through a scrubber. The acid liquor was used to absorb the ammonia from an ordinary sulphate still. After circulating a number of times, the concentration was sufficient to crystallize out ammonium sulphite crystals which oxidized to the two-thirds sulphate and one-third sulphite compound.

The chief difficulty with this process, as tried-out on an experimental scale for Mr. Curphey at Bournemouth, was to reduce the amount of water vapour coming forward with the

* Since writing the above, I understand that a small Committee of distinguished men has already been formed for this purpose. This is a matter for congratulation; and the work they have taken up needs all the loyal support and help that we can individually give.

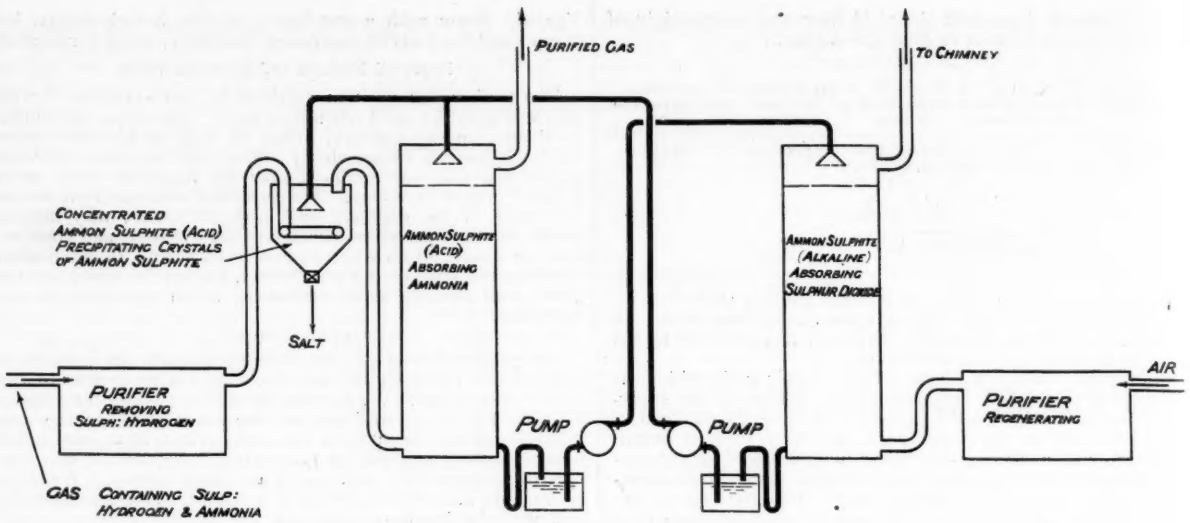


DIAGRAM OF BURKHEISER PROCESS.

ammonia to an extent sufficient to prevent undue dilution of the ammonium sulphite solution. Even if successful, this process was much less complete in its conception than the Burkheiser system, since it retained the existing oxide purifiers and sulphate still. It would nevertheless have utilized the sulphur direct on the gas-works without the intervention of the railway and the acid works—a quite useful advance on our present methods.

LIQUID PURIFICATION.

The liquid purification process developed by the Koppers Company in the United States of America, and licensed in this country to the Woodall-Duckham Companies, was a system which made possible the continuous purification of gas from sulphretted hydrogen by liquid reagents in closed vessels. It comprised two stages. In the first stage sulphuretted hydrogen was absorbed from the gas by means of an alkaline solution in a tower scrubber. In the second stage the solution was revivified in another tower scrubber by a current of air and the sulphuretted hydrogen liberated and discharged into the atmosphere, either direct in an extremely diluted form or by way of boiler furnaces in which the sulphuretted hydrogen was burnt to sulphur dioxide. The process could not be exploited in this country, since the Alkali Inspector very properly would not permit the sulphur removed from the gas to be discharged into the atmosphere either as sulphuretted hydrogen or sulphur dioxide.

Several large-scale plants operating on the above lines in the United States have experienced difficulty under certain atmospheric conditions; and in consequence the Koppers Company have been experimenting with the object of evolving a modified process to meet the difficulty. They have had considerable success, and hope to be able in the near future to have available on the above lines a process modified so that the sulphur will be recovered directly in a marketable form.

Generally, enough has been said, I think, to indicate the fruitful field that awaits the investigator in purification methods, and the desirability of stimulating research in this direction. In addition, there is still that other bugbear of the gas industry—or perhaps I should say of the gas consumer—which ought to be seriously tackled by every conscientious gas engineer. I refer to the organic sulphur compounds. Dr. Carpenter has evolved one process that satisfactorily removes them; but it is unfortunately a somewhat expensive and cumbersome one. Nevertheless, I feel strongly that until, either by this or by some other process, these sulphur compounds are removed from the gas, for so long will it fall short of being the perfectly satisfactory source of light and heat that it ought to be.

OIL CRACKING.

Another direction in which research work is desirable is that of investigating some means of increasing the efficiency of "oil cracking" in our water gas enrichment operations. The present method of spraying oil on to the red-hot brickwork of the carburettor has the merit of simplicity, but, unfortunately, labours under the disadvantage of low efficiency.

Ignoring the heat absorbed in the cracking operations, on the ground that it is largely waste heat, the thermal efficiency of the present method appears to be approximately as follows, with oil of calorific value of 18,000 B.Th.U.:

	P.Ct.
Gas enrichment	52
Oil tar, 15 p.ct. of oil used, cal. value 16,000 B.Th.U.	13
Loss	35
	100

When it is remembered that, even in a provincial company of the size of Bournemouth, the gas-oil bill is in the neighbourhood of £20,000 a year, it will be realized what an important financial bearing any considerable increase in oil cracking efficiency would have upon manufacturing costs.

NELSON PROCESS.

Some interesting tests were made at Bournemouth last year on a small experimental oil-cracking plant embodying the patented ideas of Mr. John Nelson. In this process gas oil is passed through a series of small vertical iron retorts, each containing a lead bath heated to a determined temperature, and with a certain amount of free space above the lead. The products of this process are oil gas, motor spirit, and carbon black of a particularly pure quality.

Two typical balance-sheets of the results obtained are given,

FIRST TEST.—*Maximum Motor Spirit Production.*

OIL PRODUCTS.

	Wt. Lbs.	Therms.		Wt. Lbs.	Therms.	P.Ct. of Total Therms.
34 galls., s.g. 0·86, cal. val. 18,000 B.Th.U. per lb.	290	52·3	Gas.—990 c.ft., s.g. 0·94, cal. val. 1500 B.Th.U.	72	14·8	28·3
			Motor spirit.—15·0 galls., s.g. 0 82, cal. val. 18,500 B.Th.U.	123	22·7	43·4
			Oil residue. — 9 galls., s.g. 0·93, 16,000 B.Th.U. per lb.	84	13·4	25·6
			Carbon black.—Av. cal. val. 14,500 B.Th.U.	2	0·3	0·6
			Loss	9	1·1	2 1
	290	52·3		290	52·3	100·0

SECOND TEST.—*Maximum Gas Production.*

OIL PRODUCTS.

	Wt. Lbs.	Therms.		Wt. Lbs.	Therms.	P.Ct. of Total Therms.
30 galls., s.g. 0·86, cal. val. 1800 B.Th.U.	258	46·5	Gas.—2730 c.ft., s.g. 0·972, cal. val. 1250 B.Th.U.	177·7	29·65	63·80
			Motor spirit. — 3·375 galls., s.g. 0·82, cal. val. 18,500 B.Th.U.	26 85	4·98	10·69
			Oil residue. — 4 galls., s.g. 0·06, cal. val. 16,000 B.Th.U.	38·40	6·15	13·20
			Carbon black.—Cal. val. 14,500 B.Th.U.	4·24	0·62	1·33
			Loss	10·81	5·10	10·98
	258	46 5		258·0	46·50	100·00

one with the conditions arranged for maximum motor spirit production, and the other for maximum gas production. As so much waste heat is available in a water gas plant, no allowance has been made in either case for the heat used in cracking.

These results are interesting; and in the test for maximum gas production it is shown that an increase of over 10 p.ct. is obtained in the thermal value of the gas produced, as compared with present practice, as well as an increased supply of bye-products of a much more valuable character than the present rather troublesome oil tar.

The above increased thermal value of over 10 p.ct. is, of course, calculated on the total thermal value of the oil. From the gas manufacturers' point of view, the process improves the gas carburation from 52 p.ct. to 63 p.ct.—that is, 11 on 52, or 21 p.ct. increased efficiency compared with the existing system.

The chief drawback to the process—and it is largely one of policy—is that, in a works using (say) one million gallons of oil a year, the annual production of a motor spirit on the second balance-sheet would be in the neighbourhood of 30,000 gallons—and this could be largely increased at the expense of the oil gas by a regulation of the cracking heats as shown on the first balance-sheet.

The disposal of this motor spirit would obviously involve difficulties with the oil companies, who are themselves suppliers of motor spirit as well as gas oil. The way out of the difficulty would appear to be for the oil companies themselves to investigate and perfect such a process, and to standardize a plant designed to use waste heat that could be put down on a gas-works to the mutual advantage of both parties. The gas companies have the waste heat available for cracking the oil, and a use for the oil gas produced; while the oil companies need petrol for selling in the surrounding districts.

CARBONIZATION AND COAL.

Then there are the many problems awaiting solution in that complex process which is the basis of our operations—the carbonization of coal. We have the interesting researches of Dr. Lessing on the composition and impurities of coal and the possible effect upon the carbonizing process of the chemical composition and physical condition of the ash—the possible effect of largely freeing the coal from these impurities—the character and composition of the various constituents of coal proper and their reaction towards heat—all full of very real significance as to how they may affect the production from the coal of the maximum thermal yield in the form of gas.

We have the problems that surround the many attempts to deal satisfactorily with the complete carbonization of coal—problems which arise largely from the fact that the water gas reaction, which is the necessary concomitant of such a process, is endothermic. A liberal supply of comparatively pure oxygen at a sufficiently low price would solve the difficulty; but it is easier to point to the requirement than to satisfy the need.

These and many other problems that will readily occur to every listener await solution, and I suggest that the gas industry is big enough, and has enough to gain, to make it worth while, and ought to be enterprising enough to put-up a really large research fund that would enable these problems to be tackled in a much bigger way than the present restricted resources permit. Splendid work is being done now; but there is not enough of it, and that through no fault of the distinguished scientists who, at the present time, work in our interests.

COKE.

Coke is the residual which most affects the balance-sheet of any gas undertaking; but it does not always receive the attention that it deserves from those responsible. It is almost as important to push the sale of coke and to popularize its use as it is to push the sale of gas. We are passing through a period of considerable depression in the coke market; and it is eminently desirable that all gas undertakings should conduct a vigorous campaign in their own area—pointing out the advantages of the use of coke as a smokeless fuel—in their own interests, and in the interests of the industry generally.

CONCLUSION.

I have said nothing about such important questions as legislation, changes in statutory requirements, revision of standard price, wages, &c., because I felt that these are matters belonging properly to the National Gas Council and the Federation of Gas Employers; and there is already far too much overlapping and far too many meetings for the busy gas engineer to wish to waste time at a technical meeting in considering matters which are adequately dealt with by their appropriate associations.

This brings me to a subject which I suppose affects every member here to-day. That is the difficulty we all find in carrying out fully and energetically the increasing duties and responsibilities of our positions as gas engineers, and yet attending the many meetings of the various associations connected with our industry. There are the Institution meetings, the District Association meetings, the Commercial Sections, the National Gas Council, the British Commercial Gas Association, the Federation of Gas Employers, and many other special and incidental meetings—not to mention the committee meetings which some of us have to attend as well. They are full of interest, they all need our help and support; yet if we are to put our jobs first, as we should, we cannot possibly attend nearly all of them. It is a serious matter, and I have no sovereign remedy to suggest; but it calls for full consideration, and certainly for an understanding spirit on the part of the officials of any association when members fail to attend important meetings.

The only thing we can do at present is to avoid overlapping as much as possible. This is essentially a Technical Association; and, under present conditions, I think we should, as far as possible, try to confine ourselves to technical matters—leaving questions of policy, legislation, and wages to their appropriate bodies. Generally, I would say that there should be enough of interest and inspiration in the work of the present-day gas engineer to fill him with enthusiasm and a real love for his work. His problems are many-sided, his responsibilities are great; but his job is a live proposition, with a scientific justification for its existence, and with a fruitful promise of greater usefulness to come.

THE FUEL PROBLEM.

Sir ARTHUR DUCKHAM said he had been privileged to propose a vote of thanks to their President, of whom they must be proud. In his excellent address he had dealt with subjects that were of vital and fundamental interest to the gas industry. The case he had made out for the gas industry was a wonderful one, and, in referring to it, he (the speaker) felt sure they would allow him to mention one point in the address. This had to do with the national programme for fuel development in this country from the gas point of view. He thought that they in the gas industry had lacked general propaganda, whereas they had very fine specialized propaganda; and he did not believe any of them had really formulated in their minds how a national programme of fuel development in the country should be put forward, especially from the gas point of view. A Committee were sitting on this subject, and he did hope they would come to really sound conclusions, because up to now the fuel problem had not been handled soundly in this country. It had been considered from one point of view, and he thought from a very narrow side of that one point of view. By education and propaganda, it seemed to him, this aspect could be very much widened. As to the part dealing with the works, the President had had a splendid opportunity and he had taken excellent advantage of it. Perhaps, however much they might envy him his opportunities, some of them would feel rather nervous as to taking his responsibilities. When they realized that the site of the works the President had been telling them of was formerly sea-covered; when they remembered the difficulties in connection with foundations—very grave difficulties indeed—and when they considered the whole lay-out of the works, he thought they would conclude that they knew of a place to which they could well take a friend who did not know anything of gas-works, but might be an engineer, and so able to appreciate what had been done. Mr. Moon had drawn on his own experience and the experience of others to a very full extent—especially in the wonderful handling arrangements he had installed on a very awkward site. When they visited Bournemouth and Poole—as he hoped they would all do—he was certain that the handling of the coal, coke, and ashes would interest them immensely. He had been privileged to see the works in the early stages, and to inspect the drawings; and the manner in which Mr. Moon had carried out the scheme proved him to be an engineer of very high standing. At the same time he had shown himself to be a chemist and physicist of no mean capability; and in dealing with the chemical problems of gas manufacture in the way he had done, he had overcome troubles that beset many gas engineers. He was glad to be able to say what he had, because he had been associated with Mr. Moon. Really the President was the man who started him on his travels from Bournemouth—a very nice place, with very nice people. But there was also another gentleman who must also be very proud of this address, and that was Mr. Thomas Glover, of Norwich, who must be delighted to feel that Mr. Moon, who had been with him at Norwich, should have done so splendidly as a chemist, as a chemical engineer, and as a gas engineer.

MODERN PRACTICE IN GAS-WORKS.

Mr. W. DOIG GIBB said that, in common with all the members assembled, he had listened with very great pleasure to Mr. Moon's address and to the description of the new works at Bournemouth. It was quite impossible in the time now at disposal to do more than touch the fringe of a discussion upon such works; and he suggested that at their next meeting, instead of having a formal paper, there should be a discussion on modern practice in gas-works. It would be most interesting and educative to deal with the new works in that way. He felt gratified to have been given an opportunity of seconding the vote of thanks, and of adding his personal congratulation to Mr. Moon. Many years ago he became acquainted with Mr. Moon, and had known him intimately since. Even in those early days he knew that Mr. Moon was a man who was to make good. He had certainly made good, and in making good had carried with him the respect of his brother gas engineers. He was a congenial companion, he was a well-read man, and from what he had been telling them he was evidently a good and sound engineer. [Applause.]

A Wonderful Proposition.

The President, returning thanks, remarked that it was somewhat embarrassing to hear all these things. He felt that, while he had done his best to deserve something, he had not deserved nearly all that had been said. It was gratifying to think the address had been regarded as not without interest. The gas industry at the present time was a wonderful proposition for people who were keen, and who wanted to make an impression on the problems that lay around them. He knew of no man who was more in love with his job than the average gas man one met. This became more and more marked every year. It was a splendid sign—a sign of a thoroughly sound industry; and it was a promise of future progress. There was little need for wonder that people should have love for their jobs when they got such magnificent receptions as the members had been good enough to give him. He did not know whether they would like to consider Mr. Gibb's proposal. It might be cutting-out a possible paper from another member; and the more papers they could get, the better it would be for the Association.

Mainlaying Methods at Pitwines.

Mr. A. W. Sumner (Grays) said he could understand that the mains must have been a source of anxiety. Not only was it a question of having to protect them from any corrosive matter, but there was the weight to consider. Had precautions been taken to support the mains in any way by raft, or in some other manner?

The President replied that naturally, as one could imagine on a site covered with several feet at least of clinker, and under that again several feet of mud, the question of mains gave considerable anxiety. Having regard, however, to the fact that they had already had a certain amount of experience on a different part of the same site with mains laid on this more or less floating reclamation material, they decided to take their courage in their hands and simply lay the mains in clinker, protected by clay, and with lime dressing from the waterworks softening plant so as to neutralize any acidity that might be set-up by the ashes. They judged from past experience it was pretty well a case of a floating raft. There was a certain slight movement, but no settlement at any one point sufficient to cause fracture of the mains.

The Address to be Discussed.

Mr. J. Terrace (Lower Sydenham) was sure it was the feeling of the meeting that they should have further opportunity of discussing so important a contribution; and he hoped the Committee would take into consideration the proposal put forward by Mr. Doig Gibb. The description of the works had been most interesting.

Mr. C. F. Botley (Hastings) associated himself with this expression. There were doubtless many points on which they would like further information. He congratulated the President on his excellent work.

Mr. Langford supported the proposal that Mr. Moon's contribution should be discussed at a future meeting, and it was unanimously agreed to.

Government and the Electrical Supply Industry.

The Hon. Secretary read a letter from the Manchester District Institution of Gas Engineers with reference to the proposals of the Government for financial assistance for the electricity supply industry, pointing out the necessity for protecting the interests of the gas industry and gas consumers.

After a short discussion, the following resolution was unanimously passed, on the proposition of Mr. Botley, seconded by the Hon. Secretary:

> "That while this Association learns with pleasure that a small Committee of distinguished men has been formed to consider the position of the gas industry in relation to the electrical industry and the suggested subsidy to the latter, it wishes to urge that this Committee should take the necessary steps to impress the position upon the country by means of lectures, newspaper articles, &c., and most particularly by putting the true economic facts with regard to both industries before Members of Parliament.
>
> "This Association further urges that the latter action be taken without any delay, as it feels that, while the gas industry has nothing to fear from the fair competition of the electrical industry, the booming of the latter for political purposes, if allowed to proceed any further without strong opposition, can only end disastrously for the country as a whole."

"B.C.G.A." SCOTTISH CONFERENCE.

A GOOD GATHERING AT GREENOCK.

Promoted by the British Commercial Gas Association, a successful conference, which made a direct appeal to those interested in the development of the gas industry in the urban centres of Scotland, was held in the Town Hall, Greenock, on Tuesday, March 24. The President for the day was Bailie Wm. Millar (the Convener of the Greenock Corporation Gas Committee); and he was supported by Mr. W. M. Mason (Manager of the "B.C.G.A."), Provost Brown (of Greenock), Mr. J. D. Keillor (Gas Engineer, Greenock), and Mr. J. W. Napier (Gas Engineer, Alloa.)

When the proceedings opened in the morning, upwards of seventy gentlemen, largely representative of gas interests in different parts of Scotland, were in attendance.

A Civic Welcome.

Provost Brown, at the outset of the proceedings, extended on behalf of the Corporation a hearty welcome to the members to the town of Greenock. He hoped and believed that they would have there an interesting and instructive conference. In his view, there was a great field for a cheap commercial gas, and conferences which had for their objective the furthering of this end were deserving of every possible encouragement.

The Presidential Address.

Bailie Millar, in the course of his address, said it gave him unbounded satisfaction to know that the Greenock Gas Department was sufficiently in the vanguard of the industry to merit such a visit. It was with pride the citizens and councillors of Greenock looked back to find that 98 years ago the people there were alive to the possibilities of gas as a heating and lighting agent; for in 1827 a scheme for the introduction of gas was considered and passed. Since then Greenock had never looked back. Year by year the output of gas had increased, and it was their joy locally that the undertaking had come to be regarded as one of the soundest financial concerns in the country. The book value of the undertaking was only £120,000, but the actual value was over £300,000. During the past decade alone, the output of gas had advanced from 410 million c.ft. per annum to 600 million c.ft.—an increase of approximately 45 p.ct. This certainly augured well for the future, and redounded to the credit of the Corporation as well as past and present Gas Managers. Such a wonderful record of valuable public service was surely deserving of special notice. It was a point worthy of note that in Greenock the increased use of gas coincided with the opening of a spacious showroom. There could be little doubt that the foresight of the Town Council in building and equipping such a fine showroom for the use and education of the ratepayers had been fully justified. It was an asset the commercial value of which it was impossible to estimate. Without such an opportunity of displaying the latest types of gas appliances, the public would never have benefited to the extent they had done. Over a hundred people visited the showroom daily to ask for advice on all matters relating to the use of gas. As a communal undertaking it was incumbent upon them to experiment with, and test, all new appliances before recommending them for public use. In this way the public interest was protected and consumers avoided having shoddy goods foisted upon them. The specialized knowledge and experience of the technical staff were also available for the asking; and, in his opinion, they were extremely fortunate in their choice of staff, the members of which were respected throughout the industry. He was advised by the Engineer that the maintenance staff of the public service department were accomplishing extraordinarily good work among all classes of consumers; and he was strongly of opinion that service of this kind was a boon and a blessing, not only to the consumer, but to the undertaking as well. The gas industry was represented last year at Wembley; and, as other undertakings, they in Greenock contributed their share to this enterprise. So convinced were they of the importance of such co-operative propaganda, that they were this year again contributing to the Empire Gas Exhibit, in the hope that they would enjoy even better results than last year.

Aims of the Association.

Mr. W. M. Mason, in the course of a statement regarding the work and policy of the Association, said that the three great obstacles to the widespread adoption of gaseous fuel were ignorance, prejudice, and competition. The first two of these were being gradually, but surely, overcome by good service, which included, as an absolute essential of modern successful business, persistent and consistent publicity. The task of the "B.C.G.A." was to ascertain all the facts about all the ways in which gas could best serve the community to its advantage, and then to make known these facts both to the industry and to the community it existed to serve. He specially appealed for

the fullest support of the gas exhibit at Wembley. It had been decided to continue the exhibit; and the fact that the Glasgow and Greenock Corporations were whole-heartedly joining the enterprise was a good and hopeful augury. They must keep gas prominently in the public eye, especially in these days when electricity was claiming to be a panacea for all ills. There must be co-operation on the part of the industry, and that could be manifested in no better way than by universal support of the Wembley Exhibit.

GAS SUPPLY AND COAL ECONOMY.

Mr. J. W. Napier, of Alloa, thereafter read a paper on "Gas Supply and Coal Economy," in the course of which he said it can be proved that the gas industry in its treatment of coal to produce, first a gaseous fuel, secondly coke as a solid fuel, and in addition the many bye-products, has advanced further than—and, indeed, is a long way ahead of—any other industry of to-day in the scientific treatment of coal. This fact must be insisted upon, and the public should realize what is undoubtedly true. Especially is this the case when it can be authoritatively stated that gas-works have during recent years made substantial further economies by improved processes of gas manufacture. It is undeniable that the high-efficiency operation of gas-works to-day, which has been reached by scientific research, has altered the whole question of fuel economy, and placed the matter upon a realized basis of practical success. It is not possible to conceive the displacement of the use of gas for domestic and industrial service by any other present-day form of heat energy.

Passing on, Mr. Napier expressed the opinion that, as a domestic fuel, coke has not gained the popularity it well deserves. To be satisfactory for household use, it should contain the minimum ash. In order to increase its use for domestic hot water supply, good quality coke should be supplied, clean, having little ash, and fairly free from water. Gas undertakings ought to cater more for this outlet of a smokeless fuel from gas-works, by supplying coke of good appearance and quality. By increasing the use of coke to the multitude of households, the gas industry will be contributing to coal economy and towards smokeless towns. It is to be regretted that quite a large proportion of coke produced in gas-works requires to be exported to other countries in order to find a market. This should not be so, as it is keenly felt by the gas industry that home industries and domestic uses should easily absorb the full quantity produced. It does appear as if more publicity is required in setting before the public the advantages of the use of coke.

It appears to him that the greatest asset provided by the distillation of coal in gas-works is the tar, which is the basic element of so many products necessary for a large number of processes in industry. Coal tar from gas-works and its products may be said to provide a national security for many industries, and to add enormously to the national activities in the employment of capital and labour. The internal resources of much of the wealth of this country will depend upon such factors as the distillation of coal in gas-works on scientific lines. The gas industry of Great Britain carbonizes about 17 million tons of coal per annum, producing approximately 170 million gallons of crude tar.

It is usually accepted that for intermittent use gas fires are economical. Let us examine the cost and conditions of use of gas and coal fires. With household coal of good quality at 40s. per ton, gas at 8d. per therm of 450 B.Th.U. (3s. per 1000 c.ft.), the heating costs are: Coal 1, gas 5. Correcting for efficiency with coal fires at about 30 p.ct. and gas fires about 60 p.ct., in order to produce an equal amount of heat gas will be 2½ times the cost of coal. Any mere financial comparison will unduly favour the coal fire. It is solid fuel *v.* gaseous fuel; and the latter is not dirty, has no ash to be removed, saves time, is a product of coal conservation, and does not foul the atmosphere. Suppliers of gas are able to put into the households of the country, in the form of heat, six times as large a proportion as electricity of the heat value that is in the coal which has been used to generate the gas or electricity. Electricity, even if the highest hopes of efficiency are realized, can supply only one-fourth the quantity of heat that gas is able to do.

It is desirable to put on record statistics proving the steady advance of the use of gas. From official returns, it is found that for the year 1912 the quantity of gas manufactured in Scotland was 17,301 million c.ft. During the succeeding period of twelve years ending 1924, the quantity had increased to 25,188 million c.ft. The increase is, therefore, 45½ p.ct. This increase has undoubtedly been largely obtained as the result of extended use for domestic cooking and heating, and also for industrial processes.

In discussing economy in the use of coal, it will be well to examine briefly what gas-works as industrial undertakings and large users of coal have succeeded in accomplishing. Steady progress in output of gas has been marked with progress in actually reducing, by means of new processes, the amount of coal needed to make the largely additional quantity of gas required. The actual saving of coal is remarkable. This has been brought about by two instruments, the vertical retort and the Gas Regulation Act. Before the use of vertical retorts, the quantity of gas obtained from each ton of coal was round about 10,000 c.ft. With the vertical retort, the quantity is not less than 15,000 c.ft.; and many works can show much higher yields.

A few examples will illustrate the importance and extent of the economy attained in the conservation of coal by gas-works. In the up-to-date gas-works, instead of, as formerly, 1000 tons of coal being consumed to produce a given quantity of gas, the improved retorts require only 666 tons. In the case of the Greenock Gas-Works, where the new system of retorts has been established for several years, the saving of coal per annum is not less than 21,000 tons, compared with the former process of gas making. Taking Scotland as a whole, as already stated, the increase in the quantity of gas produced is equal to 45½ p.ct. in twelve years. From a calculation, the remarkable estimate is obtained that to produce the gas required in 1924 actually less coal was used than in 1912. The figures are: Coal used for gas production in 1912, 1,730,000 tons; and in 1924 (with a 45½ p.ct. increase of gas required), 1,679,000 tons.

Discussion.

Mr. George Keillor (Greenock) said he was much in agreement with the paper. He was fully convinced that the general adoption of the process of gas manufacture was the only reasonable way of conserving the coal resources of the nation. Another aspect of the question which might be touched on was the importance of having a plentiful supply of the bye-products of gas-making—particularly tar and ammonia. He differed from Mr. Napier when the latter gave the efficiency of the coal fire at 30 p.ct. His opinion was that the figure ought to be 20 p.ct. Of course, he supposed they were all ready to concede that the efficiency of the old-fashioned kitchen range was very much less even than that—probably about one-half.

Mr. H. H. Gracie (Edinburgh) remarked that he was absolutely in sympathy with the views expounded by Mr. Napier in his paper. They were indebted to the author for bringing out the details he had done relative to the amount of coal now used in gas-making as compared with twelve years ago. It was important that the public should learn that 45 p.ct. more gas was now being manufactured in Scotland from a smaller quantity of coal than before. An argument of this nature showed the value of the industry in regard to the conservation of coal.

Mr. David Fulton (Helensburgh) said he did not subscribe to the opinion, sometimes too freely ventilated, that gas was "the real thing" now, and that it had no serious competitor or rival. He held that, while perhaps possibly the industry had done well in the past, it had still got to do much better, because the possibilities and potentialities of its competitors were enormous.

Mr. Mason remarked that, on the question of comparative efficiencies, he had that day been shown a most valuable statement applicable to Greenock. It was well that the statement should be published for the information of consumers, and perhaps Mr. Keillor would supply the particulars.

Mr. Keillor said that they heard so much about the difference in the costs of gas and electricity that in Greenock they had compiled some statistics for the use of the maintenance staff. The statement might be described as a comparison of cost for delivering equal amounts of useful heat for various purposes by gas and electricity. The data had been got together on the basis of gas with a calorific value of 410 B.Th.U. at 7d. per therm, and electricity at 1¼d. per Board of Trade unit.

Electric Radiator.—One pennyworth of electricity (crediting radiator with 100 p.ct. efficiency) will give out 2736 B.Th.U. of useful heat.

Gas Fire.—2736 B.Th.U. of useful heat (gas fire efficiency of 70 p.ct.) costs 0·28d.

Electric Geyser.—Five pennyworth of electricity (geyser efficiency 90 p.ct.) will give 15,390 B.Th.U. of useful heat.

Gas Geyser.—15,390 B.Th.U. of useful heat (geyser efficiency 80 p.ct.) costs 1·34d.

Electric Boiling Rings.—One pennyworth of electricity (boiling ring efficiency of 50 p.ct.) will give 1368 B.Th.U. of useful heat.

Gas Ring.—1368 B.Th.U. of useful heat (gas ring efficiency of 50 p.ct.) costs 0·192d.

The main facts emerging from the comparison were:

(1) Heating rooms by electricity requires the consumption of 4 times as much coal as the same service by gas.
(2) Geysers heated by electricity require the consumption of 5½ times as much coal as the same service by gas.
(3) Boiling water by electricity requires the consumption of 6¼ times as much coal as the same service by gas.
(4) Heating ovens by electricity requires the consumption of 3 times as much coal as the same service by gas.

Luncheon.

The delegates were entertained to luncheon in the saloon of the Town Hall; the hosts being the members of the Greenock Gas Committee. Bailie Millar again presided. The toast of "The Greenock Gas Department" was proposed by Bailie Hunter, of Perth, who paid a high tribute to Mr. Keillor, describing him as one of the foremost gas managers in Scotland. He remarked that the Perth gas undertaking had been put on the right lines by what a deputation learned on a visit to Greenock. Greenock had all along taken, and was still taking, a very prominent part in the development of the gas industry throughout Scotland. They must not forget that it was owing to the initiative and enterprise of Mr. Keillor and his Committee that Greenock was the first Corporation to adopt the Gas Regulation Act. A successful gas manager had to be a scientist, an engineer, and a chemist, besides being a good merchant, and these qualities were to be found in Mr. Keillor. The Chairman, in acknowledgment, said the flourish-

ing position in which the Greenock Gas Department found itself to-day was largely due to his predecessor ex-Bailie John Paterson. The toast of "The Press" was proposed by Mr. W. M. MASON.

ATMOSPHERIC POLLUTION REMEDY.

At the afternoon session papers were read by Mr. J. H. G. Whiteford, B.A., M.B., C.M., Medical Officer of Health, Greenock, on the subject of "Atmospheric Pollution in Relation to Health," and by Mr. George Keillor, on "The Contribution of the Gas Industry towards Reducing Atmospheric Pollution."

Dr. WHITEFORD said that anything which will prevent the free access of light must be prejudicial to proper and healthy development of the human being; and besides the effect of restricting the growth and development of the tissues, the absence of sunlight has a further vital influence on health—for sunlight has a most powerful destructive action on disease germs. Again, the appearance of the walls of an air cell in a section of a lung of a person living in the slums of an industrial area bears marked evidence of carbon deposit, which must have a strong relationship to the absence of perfect health, as well as to the great prevalence of tubercular disease of the lungs. On what other basis can one explain why the mortality rate from lung diseases, under one year of age, is 14 in the country districts of England, 15·5 in the country districts of Scotland, and 35 in the boroughs? The cost to a community in an industrial area for washing clothing, curtains, &c., as compared with the washing costs in a typical health resort with comparatively slight smoke, is greatly increased; and it has been calculated that this increase amounts to 7½d. weekly per household.

Mr. KEILLOR, in the course of his paper, said that if all coal at present consumed in the raw state were scientifically treated as in the process of gas making, it would provide:

1.—Enough heavy oil for generating power to drive our naval and merchant ships—without importing a gallon.
2.—Enough smokeless fuel and gas to heat all our buildings and run our factories at a low cost, and without the production of smoke.
3.—Enough benzole for all our motor traction requirements.
4.—Sufficient sulphate of ammonia to fertilize the land, with a good surplus for export.
5.—An increased production of food, owing to ample and cheap fertilization of the land.
6.—Enough fuel oil and gas to ensure ample, cheap power.
7.—A clean and healthy atmosphere for our large towns.

There is an old Italian proverb which reads: "All diseases come in the dark and are cured in the sun." We are spending money in this country in vast amounts in enlarging our hospitals, our sanatoria, and our cemeteries, that should be spent in enlarging our gas-works.

At the present time the gas-works of the country produce about 9 million tons of coke annually, but this valuable smokeless fuel is too little used domestically. If gas-works coke was employed more freely for domestic heating, the price would be less liable to fluctuate; and as this is still the most valuable credit in the process of gas manufacture, its ready sale as a domestic fuel would be reflected in the price charged for gas. While the thermal efficiency of the best type of gas-heated boiler has now reached 75 p.ct., the running cost, if any considerable volume of water was required, would exceed that of the coke-heated boiler, and its use under those conditions would usually be confined to providing an auxiliary supply. All gas undertakings should therefore place the economy and advantages of the coke-fired boiler prominently before the public, and encourage its sale as far as possible.

For all rooms in occasional or intermittent use, gas fires are not only more convenient but cost less than coal fires; while for bedrooms they are invaluable. Taking the price of gas at 7½d. per therm (410 B.Th.U. gas) a modern gas fire with seven radiants consuming 4 c.ft. per radiant will cost slightly less than 1d. per hour. So that in Greenock, at all events, a gas fire burning continuously for five hours is cheaper than a coal fire.

The Housing Committee of the Greenock Corporation early recognized the advantages of gas in the home; and they are to be heartily congratulated upon their wisdom in providing each house with a gas cooker or a grill, a gas wash-boiler, and one or two gas fires, depending upon the size and location of the houses. All houses, however, independent of size or the ability of the householder to pay, are equipped with electric light; and we are giving away no secret when we say that many of the tenants would prefer to light their homes with gas.

The contribution of the local Gas Department and its customers towards the abatement of the smoke nuisance has been considerable. There are 17,849 gas consumers in Greenock; and among them there are on free loan no fewer than 16,326 cookers, hotplates, and rings. Of course, there are also a number of private appliances in use; and inclusive of the fires in the State-aided housing schemes, 668 gas fires have been fixed since March, 1924. Invaluable assistance has been given by the Master Plumbers and Gasfitters' Association in advancing the cause which we all have so much at heart.

The output of gas in Greenock will this year exceed 600 million c.ft., equal to 2,501,000 therms, compared with 418½ million c.ft. in 1913-14 (an increase of 43½ p.ct.); and it is estimated that 75 p.ct. of the total output is used for domestic purposes.

The price of gas in Greenock to ordinary meter consumers is 7½d. per therm, equal to 2s. 6¾d. per 1000 c.ft., compared with 2s. 6d. per 1000 c.ft. in 1913-14.

What we are doing in Greenock to dispel smoke from the chimney-tops is just what every gas undertaking in the country is doing; and our united endeavours are already influencing the state of the atmosphere. Fogs are now fewer; sunshine has increased; and the death-rate from diseases affected by smoke has fallen. But there are still some 35 million tons of coal used raw each year for domestic consumption alone; and until this economic and hygienic folly ceases, the toll which smoke takes of life and health will of necessity go on.

Discussion.

Ex-Bailie LEMMON (Greenock) said the Smoke Abatement Committee of the Greenock Corporation had in bygone years been subjected to a good deal of ridicule because of their supposed inaction. His own view was that on this question of atmospheric pollution by smoke there ought to be set-up throughout the whole country something in the nature of a time limit. If at the end of the period fixed there had not been a general abatement of the nuisance, the offenders ought to be called upon to face the consequences. Everybody knew that the countryside would be the better without black smoke; and it did seem to him that the people who created the nuisance should do their best to find a remedy for it.

Bailie ISABELLE KERR wished that more women had been among the audience to hear what had been said. Speaking as a woman, she personally deprecated the great wastage that had gone on for so many years in the use of coal for domestic purposes in kitchen ranges. It was dreadful to reflect that so much work, energy, time, and money should be expended, when the food could be as easily and much more economically prepared by using gas cookers. If every man and woman, and the proprietors of large works, would concentrate on facing the problem of smoke abatement, it would soon be solved.

Mr. WHYSALL (Electrical Engineer, Greenock) said that, in his opinion, electricity was one of the best preventives for atmospheric pollution. Anyone who was at all observant in his journeyings through the industrial parts of the town was bound to note the great change that had taken place. Speaking as an individual, he was absolutely at one with Mr. Keillor in what he maintained for the Gas Department. He favoured legislation in smoke abatement, but prophesied that it would take twenty years to come to pass. He would like to see such good progress made by electricity that the gas engineers would have to look still better after their consumers in regard to the needs of domestic life.

Bailie HUNTER (Perth) said he had been delighted to hear the observations of Bailie Isabelle Kerr, and felt he must congratulate the people of Greenock upon having a lady of her outstanding talent and ability in the Town Council. Experience was showing that the owners of factories were realizing more and more that it did not pay them to send great quantities of smoke into the atmosphere. The same knowledge, unfortunately, was not so prevalent among housewives. He had been impressed by one suggestion put forward by Mr. Keillor, which was that coke should be sold in small quantities. In Perth they had tried to encourage the sale of coke among the poorer people, and had been fairly successful in creating a healthy demand in this way.

Ex-Bailie PATERSON (Greenock), speaking as an old Convener of the Gas Committee, said he was bound to confess that the Greenock Corporation, during his régime, had been most generous. It seemed to him that they had been pioneers of smoke abatement in Greenock.

Mr. JAMES BELL (Dumbarton) remarked that, in spite of the inefficient and ineffective legislation relative to smoke abatement, improvements had been going on in this direction. Such improvement as had been noted was due to the wise policy adopted by the gas industry generally, in pushing the use of gas appliances. He had the feeling, however, that they would look in vain—at least for many years to come—for any legislation which was going to do away entirely with the evil of atmospheric pollution; and this being the situation, it behoved all interested in this pressing problem to do the best they possibly could to extend the use of gas.

Mr. GAVIN M'ARTHUR (Cleansing Superintendent Greenock) said that, though he was not in any way connected with the gas industry, he felt bound to admit that Mr. Keillor had put forward a strong and convincing case for the greater use of gas. He put in a special plea for the general home combustion of domestic refuse. In attaining this end, he believed the gas industry was capable of proving a helpful ally.

The proceedings terminated with the usual votes of thanks—proposed by Mr. MASON.

DR. SALEEBY'S LECTURE.

In the Watt Hall, during the evening, Dr. C. W. Saleeby delivered his suggestive and reasoned lecture on the smoke peril and its effect on national life.

A Kent Invitation.—The Secretary of the Kent Section of the Southern District Salesmen's Circle informs us that the concluding meeting of the session will be held at Tunbridge Wells, at 3 o'clock, on Thursday, the 23rd inst., and that the members would heartily welcome the presence of some of the senior officers in the district.

MICHELL CRANKLESS GAS ENGINE AND COMPRESSOR.

Most gas undertakings in the course of their development are confronted from time to time with the difficulty that trunk mains which were laid down years ago are not of sufficient capacity at the usual low pressures available to cope with the continual growth of the cities and the ever-increasing demand for gas, particularly at the times of peak loads. To meet these conditions, the use of "boosting" or compressing plant is resorted to, in order to avoid the high cost of replacement of, or extensive addition to, the trunk mains. In the general acceptance of the term, the function of the boosting plant is to increase the pressure in the mains available from the holder, by taking the gas at the holder pressure and passing it onward at an increased pressure of several inches water-gauge direct into the low-pressure mains. The function of the compressor is to take the gas at the pressure as delivered from the holder, and drive it forward at an increased pressure of several pounds per square inch through independent high-pressure mains for delivery either into a holder in the district, far removed from the manufacturing station, or for discharge, through suitable governors, into the low-pressure reticulation some distance from the works. Machines for either of the above purposes must be reliable and efficient in operation, and must operate satisfactorily within a wide range of delivery. The driving force for the plant should preferably be derived from the gas available in the mains; as by this means the use of an outside power service is avoided, particularly in the case where the plant is placed at a point away from the gas-works.

Machines of various types have been employed as boosters, but, the volumes of gas being large and the pressures to be generated comparatively low, they have hitherto in most instances been either of the centrifugal fan class, or of one of what are known as the "positive rotary" types of blower machines embodying rotating blades or impellers. The pressure requirements of the plant may vary from a few inches water-gauge in the former case to (say) five or ten pounds per square inch in the latter case; the tendency being to increase the pressure considerably above these figures. For high pressures, the use of reciprocating machines of the familiar piston-cylinder class is often resorted to. The plant which is the subject of this article is of this type, but it will be seen that in the particular design developed it is capable of handling large volumes of gas at comparatively low, as well as at higher, pressures in a very efficient manner.

We illustrate (fig. 1) a new type gas booster unit of the latter class, constructed by Messrs. Crankless Engines, Ltd., of Melbourne. This unit consists (as can be seen) of two machines arranged on a common bedplate, and directly coupled together by a clutch coupling. The booster is the right-hand member of the unit, and comprises eight double-acting cylinders each of 9⅜ in. diameter and 8½ in. stroke. The cylinders are arranged in four pairs around the axis. The two pistons of each pair are connected by a central "yoke," carrying the articulated slippers by which the double piston is actuated from the driving slant, according to the Michell crankless construction. The slant, which is keyed to the shaft of the machine, revolves at 750 r.p.m.; the rated output of the booster being 200,000 c.ft. per hour, delivered against a pressure equal to 60 in. of water. The delivery main for the gas is 18 in. in diameter, and is seen in dotted line emerging from the bedplate beneath the booster.

The characteristic of this type of machine which especially commends it as a low-pressure blower is its high volumetric capacity relatively to its bulk. High volumetric capacity is commonly regarded as the special attribute of turbine machinery, but reciprocating blowers of the crankless type can easily be designed to deliver greater volumes of compressed air or gas than turbine blowers of equal dimensions and much higher rotary speed. The booster illustrated discharges at full load a volume of gas approximately equal to 130 times its own total bulk per minute. It is at the same time as well balanced dynamically as a turbine, and is more efficient as a compressor, especially under varying loads, than a turbo-machine. Its volumetric efficiency, determined both from indicator diagrams and by orifice and pitot-tube measurements, is 96 p.ct.

The intake of gas to the booster is controlled by rotary valves, which are directly driven by the shaft, but rotate on independent ball-bearings. The delivery valves are light automatic spring valves; the machine being thus adapted to work efficiently with varying delivery pressures, as it is usually required to do in practice.

The booster is driven by the machine which forms the left hand member of the unit as illustrated; this being a Michell crankless gas engine having eight cylinders arranged in much the same way as the cylinders of the booster, but in this case single-acting. The cylinders are of 4¾ in. bore and 5⅜ in. stroke; the rated power of the engine being 50 H.P. at 750 r.p.m. when supplied with gas of 500 B.Th.U. (net) per c.ft.

The valve-shafts of the engine drive two oil pumps located in the box-shaped bedplate that is to be seen; this bedplate serving also to contain the tank and filter for the lubricating oil, and comprising intake and delivery chambers for the gas pumped by the booster. Each pump, one of which serves for the lubrication of the engine and the other for the booster, supplies eight distinct points with oil, each being a small Michell crankless pump with eight single-acting plungers. To be seen beneath the engine is a system of switch-valves by means of which the pressure at which the oil is delivered to any one of the lubricating points can be read on one or other of two pressure gauges. Ignition is effected by high-tension

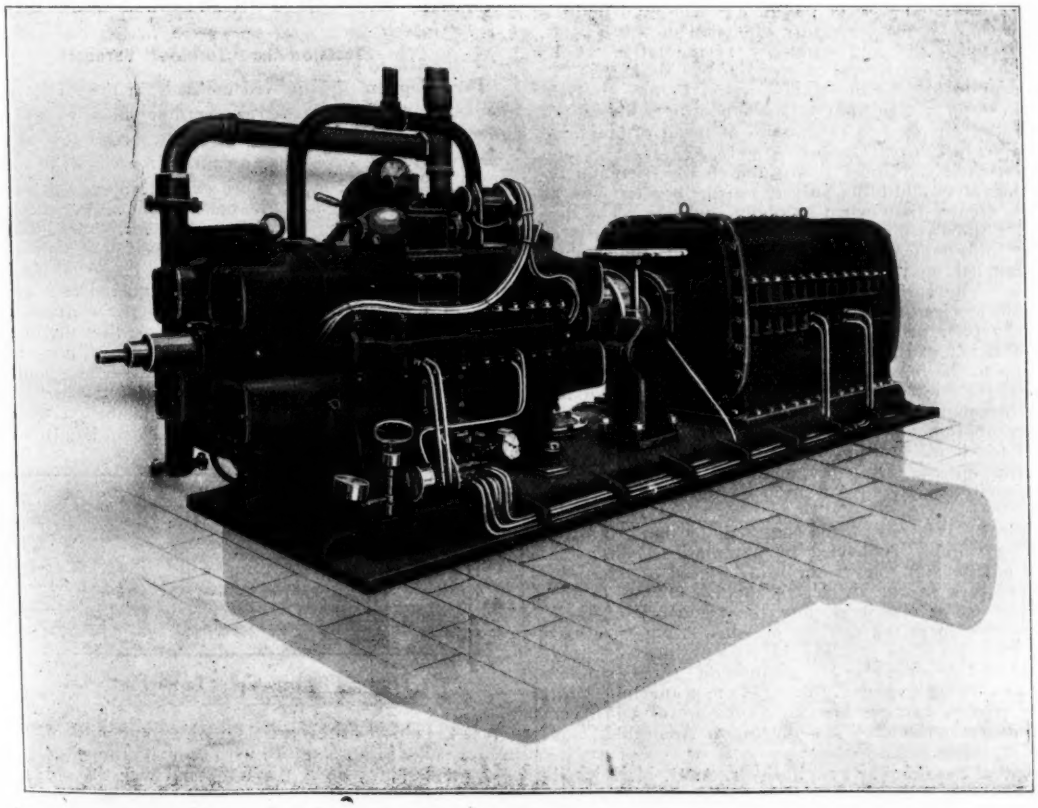


FIG. 1.—THE MICHELL CRANKLESS GAS BOOSTER.

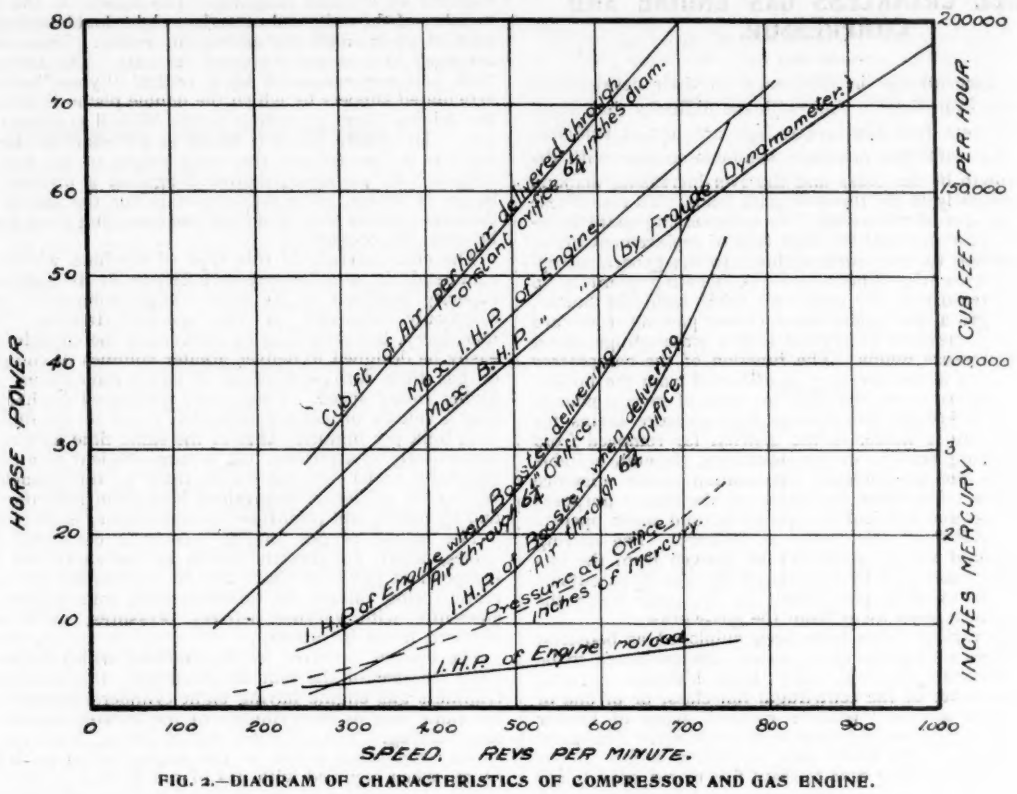

HORSE POWER
CUB FEET PER HOUR
INCHES MERCURY
SPEED. REVS PER MINUTE.
Cub ft of Air per hour delivered through constant orifice 6¼ inches diam.
Max I.H.P. of Engine.
Max B.H.P. " " (by Froude Dynamometer.)
I.H.P of Engine when Booster delivering Air through 6¼" Orifice.
I.H.P. of Booster when delivering Air through 6¼ Orifice.
Pressure at Orifice inches of Mercury.
I.H.P of Engine no load.

FIG. 2.—DIAGRAM OF CHARACTERISTICS OF COMPRESSOR AND GAS ENGINE.

magneto; a special starting magneto being fitted to provide an effective spark when the engine is turned over slowly by hand, as can easily be done by one man. This high-speed compressor, however, lends itself equally well to direct electric drive or high-speed steam engine or turbine, in cases where electric or steam drive is more desirable.

The plant described and illustrated in the present article is the second of two similar units which have been supplied to the Australian Gaslight Company. Before dispatch from the works of the makers, Messrs. Crankless Engines, Ltd., of Melbourne (whose London Office is at Aldwych House, W.C.), each unit was submitted to thorough tests. It will be readily understood that, as the flow of gas in a "boosted" main is entirely dependent on the continuity of action of the booster, the non-stop capabilities and durability of the latter are its most important features in the eyes of the gas engineer.

The principal results of the tests referred to are given in diagram form in fig. 2. In these tests the booster delivered not coal gas, but air supplied to the intake at mean atmospheric pressure and temperature of approximately 29·8 in. Hg. and 60° Fahr. respectively. Under this condition the frictional resistance in the valves and other passages of the booster was, of course, much greater than when pumping coal gas. The diagram of fig. 2 shows, in addition to the results of the tests of the complete unit, indicator and brake tests of the engine running uncoupled, and also coupled to a Froude hydraulic dynamometer. The various tests agreed in showing that the mechanical efficiencies of the engine and booster are each approximately 87 p.ct. over a considerable range of load; the volumetric efficiency of the booster being not less than 96 p.ct. at all loads up to the maximum. The gas consumption of the engine was slightly more than 0·5 p.ct. of the volume of air pumped. When pumping gas at the same pressure, the corresponding consumption would be appreciably below 0·5 p.ct.

A point of much interest in this particular design of plant is that it can operate efficiently within a wide range of delivering capacity simply by variation of the speed of the engine.

In the apparatus referred to, the control is by hand, but the plant could be suitably controlled by automatic means; the speed of the engine and compressor being varied to maintain a constant pressure in the delivering main. Owing to the number of pistons in operation, and the frequency of their movements, pulsation in the delivery pressure is almost eliminated. The two machines installed in Sydney are working satisfactorily; and a repeat order comprising three similar machines is now being executed. In addition, a machine with a capacity of 150,000 c.ft. per hour at a pressure of 5 lbs. per sq. in. is being manufactured for the South Australian Gas Company, of Adelaide.

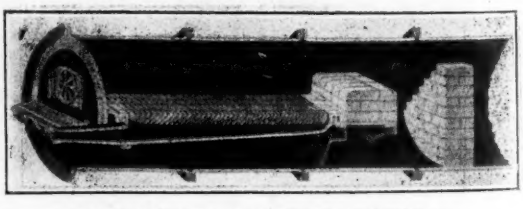
The inventor of the crankless engine—Mr. A. G. M. Michell—will be immediately recognized by many of our readers as the inventor of the world-famed thrust bearing, which has made possible the construction of the large battleships (of which H.M.S. "Hood" is an example), and which is now incorporated in all modern ships whether for the Royal Navy or for the Merchant Services. It should be added that the crankless principle is applicable to engines of all classes, and is regarded by many of the highest authorities as an invention which will revolutionize engine construction within the next few years. The sole rights for the manufacture of the crankless gas compressor in Great Britain have been secured by Messrs. George Waller & Son, Ltd., of Stroud.

COKE BREEZE FOR STEAM GENERATION.

Tests on the "Turbine" Furnace.

The adoption of improved methods in the gas process from the point of view of over-all thermal efficiency will have the effect of releasing more and more coke breeze for sale. This is particularly the case when steam is generated by waste heat. At the same time much more efficient apparatus for burning coke breeze under gas-works boilers is now available.

In this connection the "Turbine" forced-draught steam-jet furnace is of particular value, being specially adapted for burning coke breeze and dust. The general design of the furnace is already familiar; and it will be remembered that an ordinary 6 ft. by 3 ft. grate for a Lancashire boiler contains over 2000 tiny air slots, ⅛ in. wide, of such a shape that the fine material can neither fall through the air space unburnt, nor be blown off by the most powerful air and steam blast before combustion is completed. The steam user to-day is able to burn coke breeze under his boilers at high efficiency, and the gas industry can afford to sell it him at a price which yields a handsome profit.



Sectional Elevation of "Turbine" Furnace.

It is the object of this article to give some authentic figures as to the results being obtained with the "Turbine" furnace using coke breeze only; though in a general way the ordinary steam user is well satisfied with a mixture of coke breeze and coal, which gives no more trouble than does coal alone.

The first typical test, which lasted eight hours, is that carried

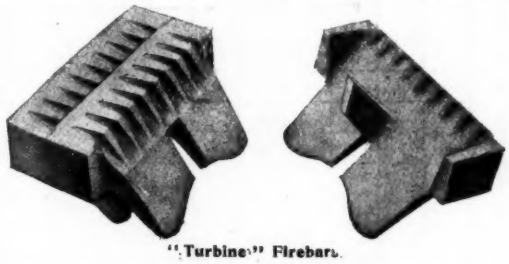
out some time ago at the Beckton Works of the Gas Light and Coke Company, using a "Lancashire" boiler 30 ft. by 8 ft.:

FUEL—	
Coke breeze, 60 p.ct. under ½ in.	
Total consumed	8400 lbs.
Average per hour	1050 lbs.
Average per sq. ft. grate area per hour.	38·2 lbs.
ASH—	
Total	14 cwt.
P.ct.	18·7
WATER—	
Total evaporated	4000 gallons.
Average per hour	500 gallons.
AVERAGES—	
Feed temperature	53° Fahr.
Pressure	66 lbs. per sq. in.
Jet pressure	60 " " " "
RESULTS—	
Lbs. water per lb. fuel as fired	4·77
" " " " " from and at 212° F.	5·7
FLUE GASES—	
L.H. side, CO_2 = 17·4 p.ct., O_2 = 2·9 p.ct., CO = 0·6 p.ct.	
R.H. side, " = 16·7 " " = 3·5 " " = 0·5 "	
Average, " = 17·0 " " = 3·2 " " = 0·55 "	

The second test was at the Tinsley Park Collieries, Ltd., of Sheffield, using metallurgical coke breeze dust:

NAME OF SAMPLE	"Coke Ash"
ANALYSIS OF FUEL as Received—	P.Ct.
Volatile matter	12·32
Ash	21·92
Fixed carbon	52·22
Free moisture	12·01
Hygroscopic moisture	1·53
Calorific value	9381 B.Th.U.
BOILER—	
30 ft. by 8 ft. 6 in. "Lancashire" and economizer. Fitted with "Turbine" furnace, 33 sq. ft. grate. Evaporation guaranteed 700 gallons per hour. Duration of test, 5 hours.	
FUEL—	
Total consumed	9550 lbs.
Average per hour	1910 "
Average per hour per sq.ft. grate	58 "
WATER—	
Total evaporated corrected to 60° Fahr.	4223 gallons
Average per hour corrected to 60° Fahr.	845 "
AVERAGES—	
Steam pressure, gauge	101·5 lbs.
Jet pressure	90 "
Feed temperature	227° Fahr.
RESULTS—	
Lbs. water per lb. fuel as fired	4·42
Lbs. water per lb. fuel from and at 212° Fahr.	4·55

Obviously, therefore, if coke breeze alone will give results of this character, when mixed with coal the question is simplified. If a coal containing 25 to 35 p.ct. of volatile matter is mixed with coke breeze so as to bring the volatile content of the product down to (say) 12 to 15 p.ct., this results in a much higher efficiency under ordinary conditions of steam generation—a fact which is not generally realized, but which in practice is of the greatest importance, especially from the point of view of selling coke breeze. This has been determined by a series of detailed tests recently carried out on a large "Cochran" boiler



"Turbine" Firebars.

equipped with a "Turbine" furnace. Under elaborate test conditions, using feed-water almost at boiling-point, a given quality of high-grade washed coal showed an evaporation of 10·2 lbs. of water per lb. of coal, whereas coke breeze gave 7·3 lbs.; the firing and attention in each case being of the best character. When the coke breeze was mixed with the coal, however, the figure for the product was found to be much above that calculated. Thus, for example, in one series of tests with three parts of coke breeze to two parts of coal the result was 10·7 lbs. of water per lb. of mixed fuel, instead of about 8·5 lbs., as might have been expected. The reason is that the increase in the fixed carbon content, and the corresponding improvement in the radiant heat emission mean a great reduction in the escape of unburnt or partially burnt volatile matter, which cannot be prevented with the use of raw coal. In many cases the results are astonishing, especially in small boiler plants not equipped with economizers.

Coke-Oven Managers' Association (Midland Section).—On April 16, at 2.30, a meeting will be held at the University of Sheffield, when a lecture on "The Combustibility and Reactivity of Coke" will be given by Prof. R. V. Wheeler. On June 11, a visit will be made to the Barugh plant of Low-Temperature Carbonization, Ltd.; and on July 9 the works of Messrs. Stainby and Lyon, Ltd., of Knottingley, will be visited.

MIDLAND JUNIOR GAS ASSOCIATION.

The Annual Meeting of the Association was held at the Council House, Birmingham, on Friday, March 27—Mr. HARRY CLARK presiding.

THE RECOVERY OF WASTE HEAT FROM FURNACES.

By WILLIAM NEWTON BOOTH, B.Sc., A.M.Inst.C.E.

When I was asked by your Secretary to prepare a paper, I chose a subject which had been occupying my attention for some time and one in which industry in general was interested, unaware that only a few days before the paper was to be presented you were to listen to a discourse on waste-heat boilers by a member of the staff of a firm who are doing a great deal of work in this direction. In spite of this, I trust that I shall have something interesting to say to you, and be able to show that, useful as waste-heat boilers are, they are not necessarily the complete and final answer to all waste-heat problems.

It is now recognized as an industrial axiom that waste of any kind must be stopped, if we are to compete with our products in the world's markets; and the annals of our industrial progress during the last century record many instances of the recovery and use of so-called waste products. Not least among these is the tremendous development which has taken place in the use of coal tar. Far from being considered a waste product, it now figures largely on the revenue account of all coal carbonization processes. While I do not pretend that the utilization of otherwise waste heat will have such far-reaching and important effects, yet it cannot be denied that the cost of heating in nearly every branch of industry is far from being a negligible item in the expenditure account; and in many industries—*e.g.*, iron and steel—it is the principal item. Moreover, the thermal efficiencies of the processes in use are often very low indeed, and in nearly every case leave much room for improvement. If also we remember that our fuel reserve supply is a constantly diminishing quantity, there is every reason for giving most careful attention to the conservation of fuel; and the recovery of waste heat is the first step in this direction.

WASTE HEAT FROM FURNACES.

Let us inquire into the nature of waste heat in connection with the operation of furnaces. In all such appliances fuel is burnt in oxygen (usually obtained direct from the atmosphere, accompanied by four times its volume of nitrogen), and the resulting flame consists of various gases heated to a high temperature. In the furnace these gases are required to give up their heat in a chamber at a relatively high temperature, and must consequently leave that chamber at a temperature somewhat above this, and carry away as sensible heat a more or less large proportion of the heat of the original fuel. This rejection of heat in the spent gases is inherent in all appliances or processes where heat is generated in, and carried by, a material fluid. In all such cases the availability for use of the heat present is a question of the temperature changes through which the heated fluid can be taken; and it is inevitable that some should be rejected. It is principally this question of the effect of temperature on the availability of heat which makes the heat engine such a relatively inefficient machine; very large quantities of heat—generally, however, at a low temperature—being necessarily discharged in the exhaust. Were it not for this inherent low efficiency of the heat engine, there is little doubt that fuel furnaces would be entirely replaced by electric furnaces for anything but quite low temperature work, because, with electrical heating, no heated material fluid need necessarily leave the hot chamber. However, the high-efficiency heat engine being an impossibility, fuel furnaces will continue to be used; and it behoves us as engineers to improve them in design, operation, and thermal efficiency.

When any fuel is burnt, the combustion gives rise to a perfectly definite amount of heat which is expended in raising the temperature of the flame gases. It will be manifest that, if the fuel is incompletely consumed, only that portion which is actually burnt in the combustion can be reckoned; and if an excess of air or oxygen is used, this can take no part in the actual combustion, but will merely add to the quantity of gases to be heated. The highest temperature is therefore reached when perfect combustion is obtained without any excess of air, and the temperature will be markedly less if such exact regulation of the air is not secured. The quantity of heat which can be given up by the flame gases in the heating chamber is clearly the product of their quantity, mean specific heat, and the difference in temperature between the flame gases and the waste flue gases—*i.e.*, the efficiency of heat transmission in the heating chamber cannot exceed the fraction

$$\frac{\text{theoretical flame-gas temperature} - \text{flue-gas temperature}}{\text{theoretical flame-gas temperature.}}$$

If this efficiency is to be increased, we must do one of two things—either increase the flame temperature or decrease the flue temperature. The latter is governed by the heat of the chamber itself, usually fixed by the conditions of the process; and apart from arranging ports and flues so as to give adequate circulation of the flame gases, comparatively little can be done

in this direction. We must therefore look towards increase in flame temperature as the best solution. This can be done in two ways:

(i) By careful regulation of the air for combustion.
(ii) By preheating as far as possible the air and/or fuel.

Fig. 1 shows the proportion of the calorific value of average coal gas fuel available for transfer in heating chambers at various temperatures and for different regulations of the air supply, but no preheat. The importance of correct regulation of air supply is apparent.

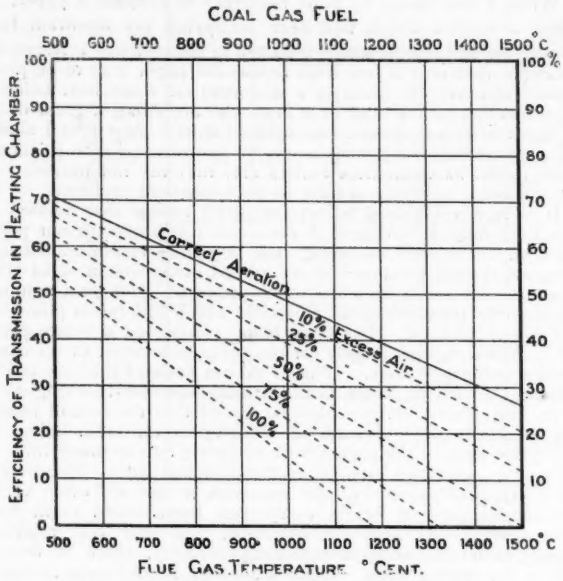


Fig. 1.—Maximum Efficiency of Heat Transmission.

It is manifestly foolish to attempt improvement by the addition of apparatus for preheating until everything possible has been done by fuel and air regulation. Fig. 2 shows the effect of preheat, assuming theoretically perfect regulation of air supply.

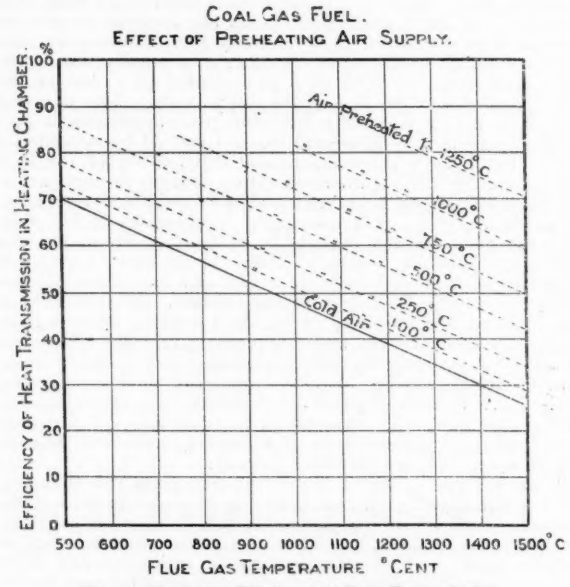


Fig. 2.—Maximum Efficiency of Heat Transmission.

The effect of preheating on the chamber efficiency of high-temperature furnaces will be seen to be very great.

It is important to reduce the loss of heat through the walls of the heating chamber, as any reduction effected here has a double effect—*i.e.*, in the chamber and in the flue. Careful wall construction can do much in this direction. The use of materials of low conductivity is becoming more and more common, and composite walls (an inner refractory lining to withstand high temperatures, and a backing of insulating material) are now usual features of furnace design. Fig. 3 shows the actual values of the losses which may be expected from such walls of various thicknesses. If, however, in addition to careful wall construction, the heat loss which must inevitably take place through the outer walls can be taken from the flue gases instead of from the chamber gases, an additional saving will be effected, as such transfer can take place without necessitating additional gases to pass through the heating chamber. It is not always possible to make this arrangement; but in many cases it may be done by constructing the primary waste gas flues so as more or less completely to surround the heating chamber proper.

Let us now pass on to the waste gases. It is manifest that those which leave the furnace chamber by leakage are lost to all practical purposes, and with them their sensible heat; and if any waste heat recovery is to be attempted, careful attention must be given to the prevention of such leakages, ensuring that as much as possible of the hot waste gases enters the

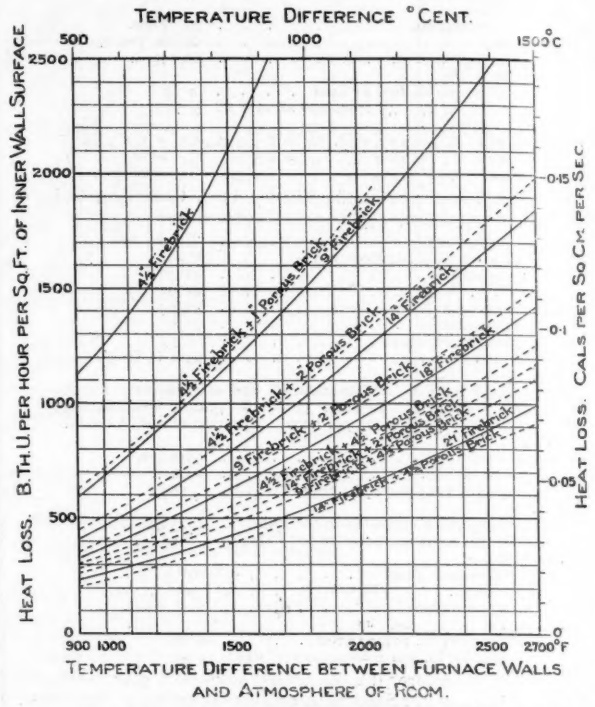

Temperature Difference °Cent.
Heat Loss. B.Th.U. per hour per Sq. Ft. of Inner Wall Surface
Heat Loss. Cals per Sq Cm. per Sec
Temperature Difference between Furnace Walls and Atmosphere of Room.
4½" Firebrick
4½" Firebrick + 1" Porous Brick
9" Firebrick
4½" Firebrick + 2" Porous Brick
18" Firebrick
9" Firebrick + 2" Porous Brick
18" Firebrick
9" Firebrick + 4½" Porous Brick
27" Firebrick
18" Firebrick + 4½" Porous Brick
27" Firebrick

Fig. 3.—Heat Loss by Conduction through Furnace Walls of Various Construction (R taken as four times wall thickness).

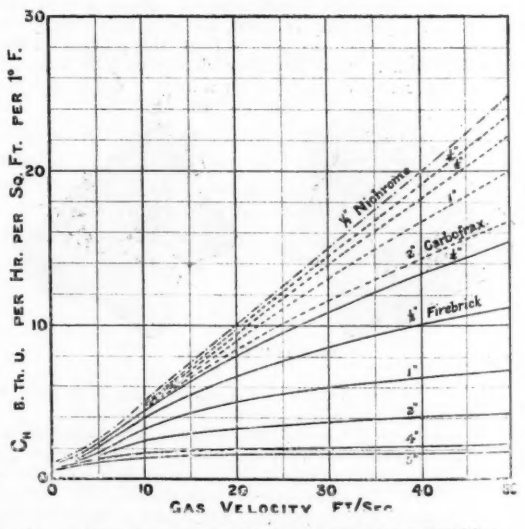


Fig. 4.—Heat Transmission through Recuperator Partitions.

flue provided for conducting them to the recovery apparatus. The sensible heat of such waste gases can then be recovered and (*a*) returned to the heating chamber, or (*b*) applied to some external use.

Heat returned to the heating chamber is more efficiently employed than it can possibly be in any external application, as it increases the heat available for transmission in the heating chamber without in any way increasing the heat losses; in fact, in the generality of cases, the quantity of gas leaving the furnace is reduced, and with it the sensible heat contained therein. Consequently, considering the added heat only, the efficiency of its utilization usually exceeds unity—a far better result than can be expected of an external application of the same heat. It is therefore towards returning to the heating chamber the largest possible fraction of the waste heat leaving the same that we must look for the highest efficiency of utiliza-

tion. There are cases where this is not feasible or where there are other sources of heat or the amount of waste heat available is much greater than can be utilized in this way. Thus in many cases there will inevitably be a certain amount of waste heat available for use external to the furnace; but it may be taken as a general thing that it is better to make a furnace self-recovering of its waste heat as far as possible, before attempting to recover waste heat for external uses.

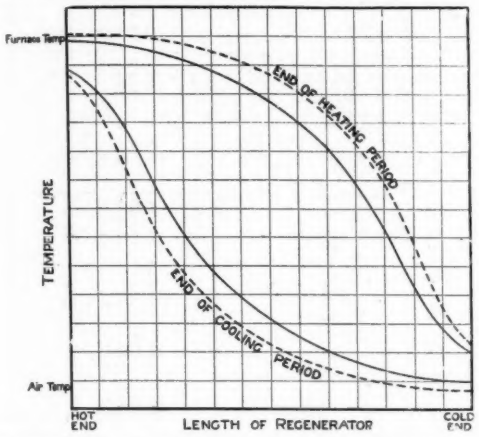
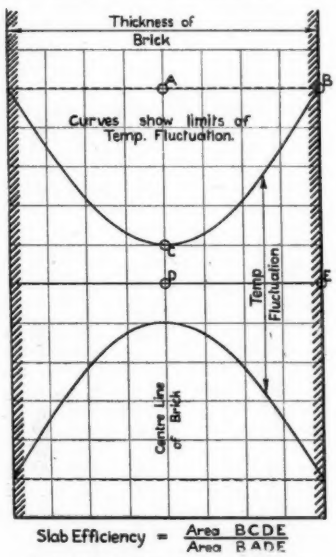


Fig. 5.—Temperature Changes in Regenerator Chequerwork.

A simple arithmetical calculation may make the argument clearer. Let us consider a small gas-fired furnace having 4½-in. walls, the total internal area being (say) 13 sq. ft., working at 1000° C. and consuming 1 therm per hour. Then the flue loss (from the diagram) is 52 p.c. and the wall loss 0·4 therm per hour. The heat balance is, accordingly, as shown in Table I., item 1. Supposing a heat recovery plant in the shape of (say) a steam boiler is attached to the flue, then 10 p.c. of the gross value of the fuel will be lost as latent heat;



$$\text{Slab Efficiency} = \frac{\text{Area BCDE}}{\text{Area BADE}}$$

Fig. 6.—Meaning of Slab Efficiency.

and assuming the boiler has an efficiency of (say) 70 p.c., there will be recovered usefully $(0{\cdot}52-0{\cdot}10)\times 0{\cdot}70=0{\cdot}294$ therm, giving a net consumption of 0·706 therm, of which only 0·08, or about 11 p.c., is usefully employed.

If we now improve the wall construction by adding (say) 2 in. of insulating material, we shall reduce the wall loss to one-quarter of its old value—viz., 0·10 therm per hour—and to get the same useful work from the furnace, the consumption will be $0{\cdot}08+0{\cdot}10+\frac{52}{48}\times 0{\cdot}18=0{\cdot}375$ therm, and the net consumption will then be 0·264 therm, as shown at item 2.

If still further improvement is made by fitting a false interior, so that the hottest waste gases encircle the heating chamber on the way to the flue, it is possible to take as much as 60 p.ct. of the wall loss from the waste gases. The net wall loss is thus only 0·04 therm per hour, and the total fuel consumption $0{\cdot}08+0{\cdot}04\times\frac{100}{48}=0{\cdot}25$ therm per hour; the distribution being as shown at item 3 of the table.

If we now fit a recuperator with an efficiency (on air only) of (say) 75 p.ct., we shall get an air temperature of about 540° C., and the flue loss will be correspondingly reduced, with an increased efficiency, as shown at item 4 of the table. With the fitting of a recuperator the temperature head in the furnace chamber will be increased, and it should then be possible to double the output from the furnace. The wall loss would remain the same, and the flue loss would not increase in the proportion of the increase in work. The results to be expected are shown as item 5 of the table.

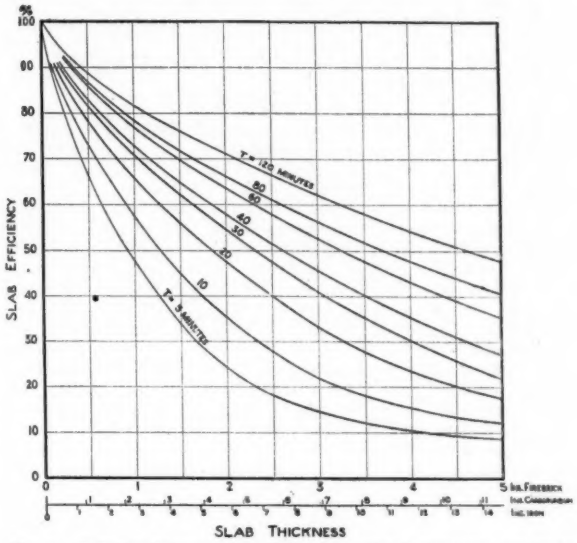


Fig. 7.—Relation between Slab Efficiency, Slab Thickness, and Cycle Periods.

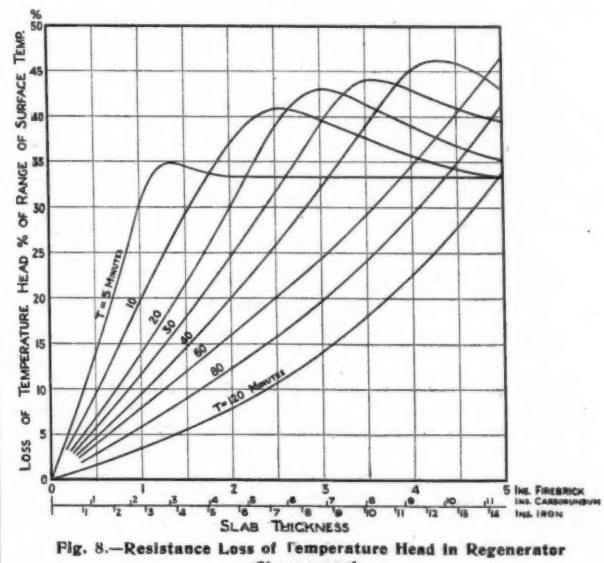


Fig. 8.—Resistance Loss of Temperature Head in Regenerator Chequerwork.

It will be seen that in every case an attempt to use the waste heat in the furnace itself is accompanied by a decrease in net fuel consumption after due credit has been given for the value of any available waste heat; and if we were to continue the process further, a still further decrease would be found.

TABLE I.

Item.	Particulars of Furnace.	Distribution of Heat, Therms per Hour.				Distribution of Heat.			Credit for Waste Heat.	Net Heat Consumption.
		Work.	Watts.	Flue.	Total.	Work.	Watts.	Flue.		
						P.Ct.	P.Ct.	P.Ct.	Th.-hr.	Th.-hr.
1	Furnace, plain 4½ in walls	0·08	0·40	0·52	1·00	8·0	40·0	52·0	0·294	0·706
2	,, wall 4½ in., 2 in. insulation	0·08	0·10	0·195	0·375	21·3	26·7	52·0	0·111	0·264
3	As 2, with inner chamber	0·08	0·10	0·07	0·250	32·0	40·0	28·0	0·031	0·219
4	As 3, with air recuperator	0·08	0·10	0·05	0·230	34·8	43·5	21·7	0·019	0·211
5	As 4, but doubled output	0·16	0·10	0·075	0·345	46·4	29·0	24·6	0·035	0·310

There are three things going into a furnace heating chamber to which some of the sensible heat of its waste gases can be transferred and carried thereby back into the heating zone. In the order of their effective importance they are:

(i) The work to be heated.
(ii) The air for combustion of the fuel.
(iii) The fuel itself.

Owing to its relatively small volume, and the fact that some of the hydrocarbons suffer thermal decomposition at temperatures above (say) 700° C., it is not always an economic proposition to preheat coal gas. With coal producer gas of the Mond type, however, the thermal capacity of the gas exceeds that of the air, and when preheated to high temperatures, endothermic reactions take place between the constituents of the gas, resulting in an actual increase in its calorific value. In such cases preheating of the gas has a very marked effect. To many furnaces, however, producer gas is delivered hot; and as by no means can it be heated above the temperature of the waste gases by utilizing their waste heat, nor those gases cooled thereby below the temperature at which the fuel gas is supplied, there must necessarily be a balance of waste heat which cannot be utilized in the furnace and is therefore available for use elsewhere.

Recuperators.

In this type working is continuous; the hot waste gases and the gas or air to be heated flowing practically in opposite directions on either side of a solid partition or diaphragm through which the heat is transmitted by conduction. The usual material is fireclay; and much ingenuity has been displayed in designing constructions to overcome the inherent defects of this material. An ideal recuperator should be compact, be capable of high rates of heat transmission with a small temperature loss, and be capable of use for long periods while still remaining gas and air tight. The material should therefore be of high thermal conductivity, non-porous, and of sufficiently high mechanical strength to allow of the use of thin partitions; while the construction should also be such that movements due to differential thermal expansion do not cause undue stress in the material, nor give rise to cracks or broken joints. On all these points fireclay leaves much to be desired.

The use of metal recuperators is now becoming common in low-temperature work—*e.g.*, preheating of air for boiler firing—and the advent of heat-resisting metals such as calorized iron, the chrome steels, and nickel chromium alloys (the latter of which may be made non-scaling at temperatures of over 1000° C.) has made possible the use of metallic partitions in furnace recuperators; and their use will no doubt extend considerably. Owing to the superior strength and thermal conductivity—over fifty times that of firebrick—very high heat transmission can be obtained, and a compact efficient design is possible.

Owing to the stresses set up by differential expansion, it is unwise to work fireclay partitions with a greater temperature difference between the faces than 120° Fahr., corresponding to a heat transmission of about 1200 B.Th.U. per sq. ft. per hour for a 1-in. partition, and proportionately less for thicker partitions; and this, together with the porosity of firebrick, which limits the allowable gas velocity, imposes a very low heat transmission limit in fireclay recuperators. Such considerations, however, do not apply to the metallic type.

Heat Transmission.

When a gas is flowing in a tube or channel, there is always close to the wall of the channel a film, the thickness of which depends upon the gas velocity, which is in streamline motion—*i.e.*, the flow is everywhere parallel to the solid surface. The transmission of heat through such a film is by conduction; and as gases are very poor conductors of heat, this film offers a very great resistance, and a corresponding loss of temperature head. In recuperators, of course, this effect is felt on both sides of the partition. As the thickness of this streamline film gets less when the gas velocity is increased, the resistance to the flow of heat diminishes also; and consequently, with a given temperature difference, much greater heat transmission can be effected when the gas velocity is high than when it is low.

At low velocities the combined resistance of the two streamline films is comparable with the resistance offered by (say) an ordinary thin fireclay partition, so that it may constitute the greater part of the total resistance; and little advantage would then be felt by making the partition thinner, or constructing it of metal. At higher gas velocities, however, the resistance of the partition becomes relatively much more important; and it is then that the advantage of metallic partitions becomes most apparent. Then, owing to the higher rates of heat transmission obtained, it is possible, without loss of efficiency, to reduce the transmitting area to such an extent that, in spite of the higher gas velocity used, only a relatively small increase in pressure head is necessary to force the air through.

It will be clear that the most efficient recuperator is obtained when the gas and air flow are truly counter-current—*i.e.*, the streams on either side of the partition are everywhere in opposite directions. The kind of heat transmission rates to be expected with various gas velocities and for various partitions are shown on fig. 4. Before leaving the subject of recuperators it should be pointed out that these appliances lose heat through their outer walls in exactly the same way as furnace heating

Table II.—*Performance of Recuperators.*

Type of Recuperator.	Illustrated in Fig. No.	Particulars of Partition. Material.	Thickness.	Area of Heat Transmitting Surface.	Waste Gas Particulars. Volume of Waste Gas at 60° F.	Cross Sectional Area of Passage.	Velocity of Flow (Corrected to 60° F.)	Frictional Resistance to Flow.	Temperature of Gases. Initial.	Final.	Air Side. Volume of Air at 60° F.	Cross Sectional Area of Passage.	Velocity of Flow (Corrected to 60° F.)	Frictional Resistance to Flow.	Temperatures of Air. Initial.	Final.	Temperature "Head." Hot End. θ'.	Cool End. θ''.	Logarithmic Mean. θm.	Heat Transmitted to Air. Total.	Per Sq. Ft. of Transmitting Surface per Hour.	Coefficient of Transmission B.Th.U. per Hour per Sq. Ft. per 1° F.	"Approximate Heat Account." To Air.	Remaining in Waste Gases.	Lost in Radiation, &c.	Recuperator Efficiency.
			Inches.	Sq. Ft.	C.Ft. per Hour.	Sq.Ft.	Ft. per Sec.	Ins.W.G.	°F.	°F.	C.Ft. per Hour.	Sq Ft.	Ft. per Sec.	Ins.W.G.	°F.	°F.	°F.	°F.	°F.	B.Th.U. per Hour.	B.Th.U.	C_H.	P.Ct.	P.Ct.	P.Ct.	P.Ct.
Natural Draught:																										
Baffle and wall	170	Fireclay	4½	55	6800	4·75	0·4	0·02	1450	1000	3100	2·15	0·4	0·02	60	560	890	940	914	30,075	547	0·6	16·5	67·5	16·0	36·0
Tile	171	,,	1½	55	6800	0·83	2·3	0 05	1450	910	3100	0·375	2·3	0·03	60	820	630	850	732	47,050	856	1·17	25·8	61·0	13·2	54·6
Horizontal tube	172	,,	1	60	6800	1·00	1·9	0·03	1450	780	3100	0·34	2·5	0·03	60	860	590	720	652	49,200	820	1·26	27·0	55·9	17·1	57·5
Vertical tube	174	,,	1	60	6800	0·95	2·0	0·05	1450	780	3100	0·25	3·4	0·05	60	890	560	720	635	51,600	860	1·35	28·3	55·9	15·8	39·6
Forced Draught:																										
Vertical tube	178	Nichrome	⅛	12·2	4200	0·23	5·0	0·4	2200	630	3500	0·125	7·8†	5·0	60	1700	500	570	534	118,000	9670	18·1	63·6	26·6	9·8	76·5
				28·0*																	4210*	7·9				

* Area of heat transmitting surface increased on gas side by the addition of "fins." † The "effective" velocity is much higher than this owing to the presence of spiral baffles in the air passages. Note the high resistance to flow.

chambers, and such loss should be reduced by decreasing the exposed area and constructing the walls of material of low conductivity. It should never be forgotten that the primary function of a recuperator is to *heat* air or fuel gas, and that the cooling of the waste gas is only secondary and consequential.

The following table gives particulars of the actual performances of some recuperators the author has had occasion to test.

Regenerators.

In this type two chambers are provided, fitted with valves so that the waste gas and air to be heated are passed alternately therethrough; the gas and air flowing in opposite directions. The chambers are filled usually with chequer brickwork which alternately absorbs heat from the hot gases and gives it up again to the air.

The following points arise in connection with the design and operation of regenerators:

(1) Their operation is intermittent, and involves the provision and working of change-over valves. They are therefore not so simple as recuperators, and not so suitable for relatively small installations.

(2) At each reversal the fuel gas or hot air contained in the regenerator at the time is passed direct into the flue, while the cooled waste gas returns to the furnace. Unless care is taken in working out the proportions of the design, this may have a very appreciable effect in reducing thermal efficiency.

(3) The hot regenerator provides a considerable store of heat; and this may be returned to the heating chamber very rapidly, if occasion requires it. For some processes where a very rapid rate of initial heating is required, followed by a period of slower heating or maintaining the work at a high temperature, this property of the regenerator may be used to advantage.

(4) The capacity of the regenerator as compared with the furnace fixes the period which may elapse between reversal of the valves; and this may be varied between relatively wide limits so as to meet the needs of the particular problem under consideration.

(5) The heat capacity of regenerator furnaces is considerable, and consequently they are not so suitable for intermittent working as furnaces having a lower heat capacity.

So far as the author is aware, no complete theory of the heat transmission of a regenerator has yet been worked out. The following factors however affect the design of such apparatus and the calculation of the amount of brickwork necessary in any particular case.

Surface Temperature Changes in Chequerwork.

Fig. 5 shows the progressive temperature changes which take place during the heating-up of a regenerator chamber. It will be seen that at the ends of the chamber the range of temperature is comparatively small, while in the middle it is much greater. The mean temperature range of the surface is as indicated on the figure, and is usually not much more than half the temperature difference between the hot and cold ends. The actual figure in each case may be obtained or worked out from a design, and may be expressed as a factor which the author terms "surface temperature efficiency."

When the surface of a conducting material is subjected to a periodically varying temperature, the range of temperature at internal points in the material becomes steadily less as we recede from the surface, and the phase of the temperature change becomes likewise progressively later. Fig. 6 indicates this effect, showing the temperature of the various portions of the material at the commencement and at the end of the heating period. It will be seen that the heat stored is much less than would be the case if all the material were to go through the same temperature range as the surface, and the ratio of the heat actually stored to that which would be stored under these conditions is called the efficiency of utilization of the material, or more usually the "slab efficiency" of the chequerwork. The values for various chequerwork and times of reversal are shown in fig. 7.

There is still another factor to consider. Owing to the above-mentioned phase lag of temperature change—due to the fact that all conducting material offers a certain resistance to the flow of heat—the temperature of the surface during cooling lags behind the corresponding temperature during the heating period—*i.e.*, heat is always given out at a lower temperature than that at which it was stored—and this causes a further loss of efficiency. The value of this is shown on fig. 8 for different values of slab thickness and reversal time.

Having given the capacity of a particular furnace and the reversal time desired, we are now in a position to estimate the amount of chequerwork required in the regenerator. First calculate the total amount of heat contained as sensible heat in the waste gases during the period of one reversal—*i.e.*, half-cycle of operations. Let its amount be H. Then, if w is the weight per unit volume of the chequer material, s its specific heat, $(\theta_f - \theta_a)$, the difference between the temperature of the furnace and atmosphere, T the surface temperature efficiency, S the slab efficiency, and R the loss of efficiency due to resistance for any particular thickness t of slab chosen, e have

Heat absorbed and restored $= Q.w.s.\ (\theta_f - \theta_a)$ T.S. $(1 - R)$

where Q is the actual volume of chequer material, and is equal to $\frac{A\,t}{2}$ where both sides of the slab are exposed. The total area necessary to absorb the amount of heat H (*i.e.*, the total of gas and air regenerators) is then

$$A = \frac{2\,H}{t.w.s.\text{T.S. } (1 - R)\ (\theta_f - \theta_a)}.$$

Our argument so far has taken no notice of the difference of temperature which must exist between the solid surface and the gases in order to effect the transmission of heat between them. This difference depends upon the disposition of the solid surfaces, the distance apart, and the velocity of the gas flow. As in the case of recuperators, the best results are obtained by the use of thin solid slabs, narrow gasways, and high gas velocity, though it will be realized that the presence of dust in the gas streams, and the necessity for mechanically sound constructions, tend to place a limit to fulfilling our desires in these directions.

In the author's opinion, recuperators are preferable to regenerators for small furnaces, especially those where it is not necessary to have a large storage of heat for occasional use; and by careful attention to design they may be made very compact and highly efficient, and the heat losses due to the conduction through walls reduced to a very low figure. Regenerators will, however, continue to hold their own for very large installations where the added complication of reversing valves is not a serious drawback, for furnaces where a sudden large increase in heating rate is required occasionally, and also for large furnaces working at temperatures sufficiently high to cause rapid deterioration of the material of a recuperator.

We may sum up the conclusions at which we have arrived as follows:

1. It is better to arrange, if possible, for the heat conducted away through containing walls to be supplied by the spent gases rather than from the flame gases in the heating chamber.
2. Waste heat recovered and returned to the heating chamber can be utilized at a higher efficiency than in any external appliance.
3. Therefore it is only after full self-recovery has been practised that the recovery of waste heat for external purposes should be attempted.

Discussion.

The President said the paper was interesting to all, and particularly to those engaged on the industrial side of the gas industry.

Dr. Walter (Birmingham Gas Department Research Laboratories) proposed a vote of thanks to Mr. Booth. The subject discussed was, he observed, of especial interest to him. The design of furnaces did not receive the attention it deserved. While engineers had improved the efficiency of prime movers, inefficient furnaces were still installed. The figures obtained by the author were remarkably good. It appeared to him there were great possibilities in the use of nichrome as applied to recuperators. He would like to know what Mr. Booth's experience was of calorized steel recuperators.

Mr. J. H. Gee (Senior Vice-President) seconded the resolution.

Mr. Booth, replying to the vote of thanks, said he had used calorized iron with fairly good results; but with other calorized material his experiments had not been pursued. He had found calorized steel inferior to nichrome. Regarding the insulation of smaller furnaces, he pointed out that no standardized policy could be followed. If the furnace were to be used for short periods, it was no use insulating at all; but if it were to be used for a long time, then it was advisable to insulate. It was important to keep down the heat capacity of the furnace itself.

Leakage Surveys.

A paper on the reduction of gas losses was presented at the sixth annual convention of the Natural Gas and Petroleum Association of Canada, by Mr. Victor A. Ogilvie, Engineer to the Dominion Natural Gas Company of Buffalo, who describes a suitable installation for test connections employed on a leakage survey, where the main system is divided into small sections for testing separately. Three 1-in. taps are made in the main, and two rubber gas main bags are inserted at the centre tap, and inflated. A 1-in. riser is then screwed into the centre tap or bag hole, and water is poured into the riser until a hydraulic head is obtained which balances the gas pressure on each side of the inflated bags. If gas bubbles appear in the riser, it is an indication of leakage past one, or both, of the bags, and the trouble must be corrected. Insufficient inflation, sediment in the main, or other troubles, may necessitate re-setting the bags to secure a positive seal. One of these bag installations is required at each point where stoppage is needed to secure a completely isolated section. It is very necessary that each bag installation is an absolute seal, as the accuracy of results depends a great deal upon the degree of skill exercised in securing a complete isolation of the tested section. To proceed with the test, a portable test meter is connected with flexible hoses attached to the 1-in. taps on either side of the gas bag space. The meter is equipped with valves and unions necessary for control and convenience in erecting and dismantling the set-up. There is a gauge to indicate the pressure of the gas measured. If there is too much pressure fluctuation to assure reliable measurement, it is advisable to insert a regulator in the riser stem on the outlet side of the installation. A by-pass is provided, to speed-up the flow of gas in filling the isolated section in the case of a large-capacity test.

THE MODERN DRAWING OFFICE: ITS PLACE IN THE SCHEME OF GAS-WORKS MANAGEMENT.

By J. E. LEDINGHAM, of the Tottenham District Light, Heat, and Power Company.

[Before the London and Southern District Junior Gas Association, March 20.]

In undertaking to read a short paper on the drawing office, I am afraid that it will hardly be possible to bring forward entirely new information in the space available. This remark is addressed particularly to those members present who already control drawing offices of their own—but I hope that such members will find interest in what may be a different viewpoint, and lead a useful discussion. The paper is written chiefly for those who have no great knowledge of the modern drawing office, or of its correct place in the scheme of gas-works management. A brief retrospection will be useful.

The drawing office of days gone by was undoubtedly regarded by the executive officers of most engineering concerns—gas-works included—as a more or less necessary evil; "necessary" because very little constructional work could be carried out without a drawing of sorts, and evil because the drawings of that day were, perforce, only artistic pictorial representations of the completed piece, leaving very much of the detail work to the effort and judgment of the shop foreman and workmen. All honour to the pioneers on both sides; but the system was wrong. Too often was the article, as finally produced, the outcome of a system of "trial and error" during production, wherein much time and energy were misplaced and material wasted. There was little co-operation between the shop and the drawing office; and, as one may well imagine, the relationship between the heads of these sections was none too cordial. They blamed each other for failures, while each laid claim to success. Such conditions existed many years ago; but the evils have been gradually eliminated until the drawing office now stands in a proud position. It is the engineer's "technical problem solving department," and may be likened to the "hub" of the wheel of constructional activity, the axle of which is the chief engineer.

To those members not directly connected with the constructional engineering side of our business, it will not be amiss to point out that the modern gas-works—considered as a whole—is a very self-contained institution. It constructs and maintains its own general plant, buildings, roads, railways, and wharves, possesses the various workshops, machinery, and tradesmen for carrying out such work, generates its own steam, hydraulic, and electric power for driving its running plant, handles mechanically its raw materials and bye-products, and delivers the latter to customers by its own fleet of motor lorries, and so on, with all sorts of ramifications. I mention these things simply to illustrate the classes of work which the chief engineer expects his drawing office to deal with down to the minutest detail, and for which he requires designs, detail drawings, specifications, and schedules of materials, for issue to his workshops, or, if his own shops be too busy, to issue for tenders.

The drawing office, properly organized and working with method and system, thus becomes a very useful section; and I now propose to show how the duties of a small nucleus staff can be best arranged to deal efficiently and economically with such work. My explanation will be clearer if you will refer to the diagram in which the personnel of the drawing office is shown in the form of a genealogical tree.

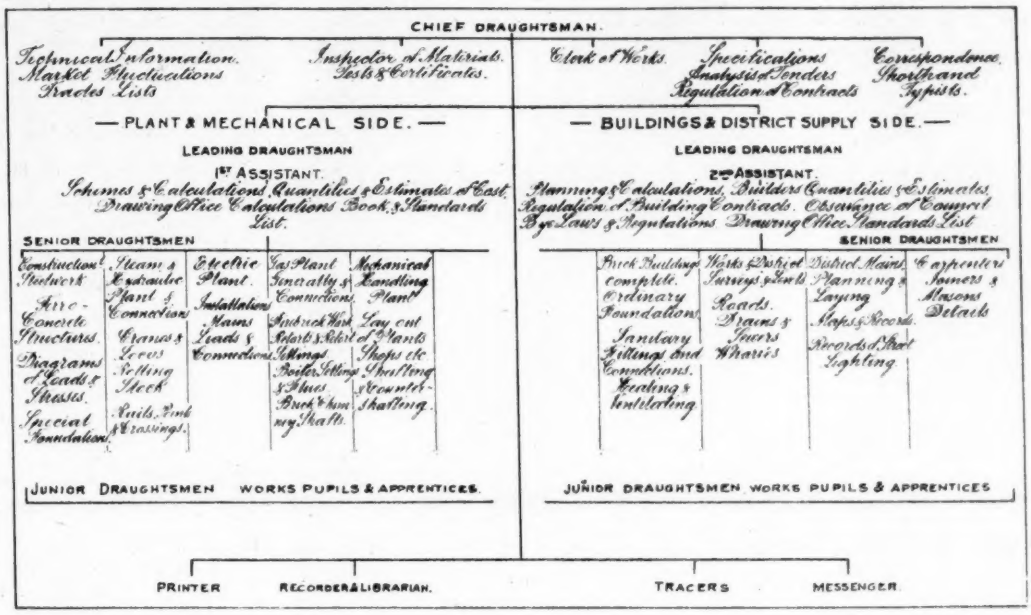
The organization of the brain values of his staff rests with the chief draughtsman; and in order that the ever-present variety of work may be efficiently dealt with, it will be clear that the nucleus staff must be carefully selected, capable, hard working, and contented men—earnest and thorough. It will be seen that the chief draughtsman deals personally with all the technical correspondence calling for details of work in hand or placed to contract, draws up all specifications, issues inquiries, and analyzes tenders, regulates contracts, correlates technical information, arranges and supervises technical experiments, directs inspection of materials, and receives the reports of the clerk of works. In addition, of course, he directs the design and passage of all work through the drawing office, and is responsible for the maintenance of discipline. In the last-named items he is directly assisted by his two leading draughtsmen; one (called first assistant) preparing the original designs for the more important schemes on what may be called the "mechanical" side, the other (called second assistant) on work of equal importance on the "building" side. These men, in turn, feed the senior draughtsmen with work, the general scheme for which has been approved by the chief engineer. The duty of the senior draughtsmen is to prepare fully-dimensioned and accurate scale general arrangement and detail drawings in pencil, and a complete schedule of materials and weights for purposes of ordering. In this they are in turn assisted by junior draughtsmen, works pupils, and apprentices, who thereby gain a very necessary experience and training. An endeavour is made to sectionize the work—that is to say, to keep the same class of work to one man, or group of men; but it is obvious that a generous overlapping of sections must and does occur. The advantages of this overlapping will be equally obvious in that it relieves the work of the monotony of sameness so far as the draughtsman is concerned, and protects the office against the unavoidable absence of individual members of the staff through sickness and holidays.

Subsequent to the completion of the pencil drawings, these are carefully checked by a senior or leading draughtsman, and are passed to the tracers (male or female), who trace the work in indian ink upon standardized sheets of tracing linen. These tracings are again checked, and afterwards passed to the printer for the requisite number of prints. There are very few drawing offices to-day which do not include in their equipment an electric photo printing copier—a cheap and speedy method by which to obtain many types of prints—*e.g.*, the "wet process" prints, "Ferro-Prussiate," "Ferro-Gallic," and "Pellett," and the dry process of "true-to-scale" prints, "Ordoverax," "Sepia," and "Ozalid." The "Ferro-Prussiate" or blue print is by far the commonest production and cheaper than any other; but it is in many ways an unsatisfactory article, shrinking unequally during the drying process, difficult to read in dark places, and likely to fade in a strong light. Its shrinkages render it unsuitable for small-scale architect's drawings whereon dimensions are conspicuous by their absence, and where the user is compelled to apply a rule or scale. White prints of the "true-to-scale" variety are used for all such work. Time will not permit a detailed description of these processes; but it may be well to state that the "Ozalid" is the most recent introduction. It produces a print having a deep chocolate line on a white ground, is true to scale, no more costly than the blue print, and is obtained more rapidly. It is handy; but its permanency only time can prove.

The recorder is employed to classify, comprehensively and accurately to index and record all office drawings and tracings, to put these away, keep them in good order, and find them rapidly when they are required. The "logging-in" of all drawings received or issued is of great importance. It requires the provision of (1) a well-bound drawing register in book form, numbered in folio and bearing printed headings to vertical columns—the headings stretching completely across the folio opening. The "headings" in sequence reading from left to right are as follows: "Series No.," "Drawing No.," "Description or Title," "Office of Origin," "Original No.," "Date Made or Received," "Correspondence No.," "Section Concerned," "Order or Contract No.," "Copies Issued and Date," "Remarks and Cross References." (2) A Stolzenberg type card-filing cabinet for the reception of coloured cards 6 in. by 5 in.—as many drawers to the cabinet as there are colours (or sections) to be considered. The cards will lie behind the usual buff-coloured alphabetical index division cards in each drawer. Each card will bear the following printed headings to vertical columns: "Description," "Maker," "Drawer," "Drawing No."

The system is extremely simple but very effective, and particularly so when a piece of work involves not only the original schemes evolved under instructions received from the chief engineer, but also a works portion and a contract portion, each forming part of the finished piece. The drawings for the entire piece of work would all bear the same series number, and would each bear a sub-number in the true chronological order of their advent. They would be found at a moment's notice, now or years hence, by reference to the cards; and if required, the history attaching to each one can at any time be obtained from the register. They will be found all together in the storage drawer, arranged with the parent drawing at the bottom, and the drawing last made or received on the top. There is no waste of space in storage drawers, since "series" is laid upon "series" until the drawer is full, and the next lower drawer of the press (emptied of its "years old" accumulation to a more remote storage) is available to receive current work. All tracings (negatives) are stored in an exactly similar manner, but in the "tracings" drawers. Only in very exceptional circumstances should the office copy be loaned to the works; and when this does occur, the early return must be urged and enforced. It may appear to one unused to a system of this kind that its adoption would lead to a large amount of clerical work. This is not so. The information required under the printed headings is simple and terse.

In a gas-works where the maintenance of running plant is of such vital importance, it is imperative that the full set of contractors' working drawings to which a plant has been constructed, should always be available. By adopting this precaution, not only can breakdowns be speedily dealt with, but the cause of a breakdown can often be traced to an inherent defect in design, undetected in the original scrutiny, the defect remedied, and the likelihood of further breakdowns in the same part be reduced to minimum. The scrutiny of contractors' drawings prior to the manufacture of new plant should receive special attention on the part of the gas-works drawing office, and the specification should be so drafted as to allow the chief


CHIEF DRAUGHTSMAN.
Technical Information. Market Fluctuations Trades Lists
Inspector of Materials. Tests & Certificates.
Clerk of Works.
Specifications Analysis of Tenders Regulation of Contracts
Correspondence Shorthand Typists.
— PLANT & MECHANICAL SIDE. —
LEADING DRAUGHTSMAN
1ST ASSISTANT.
Schemes & Calculations, Quantities & Estimates of Cost, Drawing Office Calculations Book & Standards List.
SENIOR DRAUGHTSMEN
Construction Structures
Steam & Hydraulic Plant & Connections
Electric Plant
Gas Plant Generally & Connections
Mechanical Handling Plant
Arc-Concrete Structures
Cranes & Lifts Setting Stock
Installations Mains Leads & Connections
Indirect Work Retorts & Retort Settings
Lay out of Plants
Diagrams of Leads & Theses
Coals & Irons Boiler Setting & Flues
Shops etc Shafting & Countershafting
Special Foundations
Coals, Print & Drawings
Brick & Chimney Shafts
— BUILDINGS & DISTRICT SUPPLY SIDE. —
LEADING DRAUGHTSMAN
2ND ASSISTANT.
Planning & Calculations, Builders Quantities & Estimates, Regulation of Building Contracts, Observance of Council By-Laws & Regulations, Drawing Office Standards List.
SENIOR DRAUGHTSMEN
Brick Buildings complete. Ordinary Foundations
Works & District Surveys & Levels
District Mains Planning & Laying
Carpenters Joiners & Masons Details
Roads. Drains & Sewers & Wharfs
Maps & Records
Sanitary Fittings and Conditions. Heating & Ventilating
Records of Post Lighting
JUNIOR DRAUGHTSMEN WORKS PUPILS & APPRENTICES
JUNIOR DRAUGHTSMEN WORKS PUPILS & APPRENTICES
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TRACERS
MESSENGER

engineer to call for any reasonable modifications to the contractors' design which he may consider beneficial. All "approved" contractors' drawings should be submitted in duplicate. Both copies should receive the registered number. One of the copies should be retained by the drawing office as "office copy," the other one should be issued to the works, to facilitate inspection during erection.

The recorder acts also as librarian—indexing under a card system those articles appearing in the Technical Press and marked for record by the chief engineer or his heads of departments. Further, he lists and puts away all catalogues received from various manufacturers. In small offices, the duty of the "recorder" may be combined with that of the printer; but in large offices it will require the whole time of one person —(say) a partially disabled employee—who will give it special and precise attention. The clerk of works acts as a link between the drawing office and the works. It is his duty to see that all work is carried out in strict accordance with the drawings and specifications issued by the drawing office. He is indispensable on all work let to contract, keeping a rigid check, and signing all vouchers daily for work carried out on a priced schedule basis. The inspector is employed to visit the works of contractors, examining and testing, gauging and stamping all such pieces of material and plant which cannot be so conveniently treated after delivery. All his reports and test sheets are filed with the contract papers. When the nature of the work permits, it is sometimes convenient to depute the clerk of works to act also as inspector, but only on visits of short duration.

In so short a paper it is not possible to devote any more time to a more detailed description of the routine duties of individuals forming the drawing office personnel, and it now remains to describe briefly the method and system by which drawings are produced, "issued to," and "dealt with" by the works section concerned.

In most cases the chief engineer institutes the "requirement," and in collaboration with his chief draughtsman decides upon the scheme in its broad outline and idea. Designs are then prepared by the drawing office probably in two or three forms; and after careful criticism and discussion, from all points of view, the necessary general arrangement and detail drawings are prepared in pencil only—for discussion with the works engineer. It is impossible to emphasize too strongly the necessity for close and friendly co-operation between the works and the drawing office; and to this end the works engineer and chief draughtsman together examine and discuss all important drawings immediately prior to their completion, in order to modify or embody features which, in the works engineer's opinion, will lead to simplification either in manufacture or in subsequent maintenance. It is also possible that his specialized knowledge of local conditions will allow of his pointing out a difficulty unforeseen by the designers. Such advice is very valuable to both designer and draughtsman, inasmuch as the very nature of their task trains them to think along prescribed lines; and though they will include all the main essentials to a job, they are apt to omit some useful trimmings, or ignore awkwardness in erection.

After consultation with the works engineer, the drawings are amended, if necessary, and submitted to the chief engineer (together with an estimate of the costs of carrying out the work) for final modifications and approval, and instructions as to the division (if any) of the work between "works" and "contractor." The chief draughtsman then issues the necessary number of shop copies to the works engineer, accompanied by a memo explaining clearly but concisely the full extent of the work to be carried out by each of the works sections concerned. The memo states also the extent of any supplies placed or being placed to contract by the drawing office, and the date that these are due for delivery. A schedule of materials required, complete down to the last bolt and washer, is placed on all shop copies issued; and it is convenient to wash-in in a standardized colour—(say) crimson lake—all pieces forming any part of the supply by contract. To facilitate the smooth passage of work through the shops, it is a recognized rule that non-standard parts shall be excluded from designs, except in very special circumstances. The enforcement of this rule has the effect of decreasing the varieties and shapes and sizes of stock held in the works store, and tends to uniformity of practice in the drawing office in the selection of those materials and sizes included in the drawing office standards list.

The foregoing procedure enables the works engineer to allocate to the job the appropriate works cost number, and to make out the necessary demand notes on the works stores for the withdrawal of the requisite materials. A duplicate set of shop copies is issued simultaneously to the clerk of works, who will report progress.

No alteration or variation is to be made to the details as shown on a completed drawing without first obtaining the consent of the chief draughtsman, whose duty it is to preserve accurate records. If the alteration is authorized, it is duly recorded on all copies extant; the office copy receiving in addition to the illustration the reason for, and date of, the amendment. In connection with this clause the writer favours the idea that the draughtsman responsible for the actual drawing-out of any important piece of work should be deputed to visit from time to time the scene of erection until the work is completed. The work of the drawing office in respect of any one job terminates at this point so far as the executive side is concerned; but after the installation has been completed, the small-scale representation is made on the general works plan, for purposes of final record.

In writing this short paper I have had in view the main principles to be observed rather than a detailed description of any one system; but I am indebted to my own Chief Engineer for his kind permission to include certain features of organization instituted by himself and which work well in practice.

Discussion.

The PRESIDENT pointed out that the main object of a gas company was to make dividends; and when any new work was projected, this was the underlying motive. Every scheme put forward must be accompanied not only by an estimate of the actual work, but also by an estimate of its working effects. Mr. Ledingham, he thought, had not stressed this point. The organization outlined by the author was Utopian. Mr. Ledingham had suggested that no alteration or variation should be made to the details as shown on a completed drawing without first obtaining the consent of the chief draughtsman. He did not quite see how the author was going to enforce this idea.

Mr. LEDINGHAM said that, regarding the financial aspect mentioned by Mr. Booth, no work was put forward until it had obtained the full sanction of the engineer, who, of course, was always supplied with an analysis of costs of the work in operation. The organization outlined in his paper referred to a large drawing office; but it was easy to conceive a smaller system based on the same idea. At all times co-operation between drawing office and works staff was not only desirable, but necessary. This co-operation was practised to advantage at Tottenham. The works engineer should be consulted before any drawing approached the stage of completion. This eliminated a great deal of after-alterations.

Mr. A. Broadbent, of the Gas Light and Coke Company, said that the lay-out outlined in the paper was admirable. Did Mr. Ledingham find it necessary to have drawings under lock and key?

Mr. Ledingham replied that confidential drawings were always locked up, but that general drawings were not. As he had stated in his paper, a recorder was employed to handle drawings. He kept a log of all drawings, and it was always possible to trace any one of them.

Mr. Cleave Cross remarked that the paper had been written from the point of view of a draughtsman, to whom, of course, the system was undoubtedly ideal. If they asked a chemist to set-out how he would like to run a works, he too, from his viewpoint, would explain an ideal system. With a scheme such as put forward by Mr. Ledingham, he suggested that the powers of the drawing office would be out of proportion.

Mr. Ledingham emphasized that unless there was give and take on both sides any system was bound to fail. All work, he pointed out, was directed by the chief engineer, and works engineers and chemists were consulted when any new scheme was proposed.

Mr. Grogono said that, from financial considerations, it was necessary that work should first go through the hands of the works engineer, who would pass it on to the draughtsman.

Mr. Frost remarked that Mr. Ledingham, at the outset of his paper, had stated that many drawings were purely artistic. He could endorse this statement. The draughtsman, of course, atoned for this by pleading for closer co-operation; and he was sure that all heartily agreed that this co-operation was necessary. The initial details of any scheme should be practical. In the South Metropolitan Company, when any important work was projected, the drawing office found out what had already been done, and they got advice from works superintendents and foremen. After the work was finished, any subsequent alterations were carefully recorded, and old drawings destroyed.

Mr. A. J. Nichols, of the Gas Light and Coke Company, remarked that little had been said about the works draughtsman, who had to be "everything combined."

Mr. Ledingham thought it preferable to have all the draughtsmen under one roof.

Mr. Bevington asked how the mains and services were recorded.

Mr. Ledingham replied that, as new mains were laid, they were drawn on large-scale Ordnance survey maps. Small sections of these maps were issued to the main-laying gangs, and all necessary information was recorded. No records of services were kept in the drawing office.

Mr. Newton Booth, in bringing the discussion to a close, said that Mr. Ledingham had given them a new subject to record in the Transactions of the Association. The idea outlined was certainly a step in the right direction.

Mr. V. P. Hart, of the South Metropolitan Gas Company, proposed, and Mr. W. R. Moger, of the Tottenham District Light, Heat, and Power Company, seconded, a vote of thanks to Mr. Ledingham.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

A meeting of the Association was held at Swansea on March 21. Mr. B. J. Bell, President, was in the chair, and was supported by Mr. W. H. Johns (Engineer and Manager of the Swansea Gas Light Company), Mr. E. Ablett (Secretary), Prof. F. Bacon, M.A. (Professor of Engineering, University College, Swansea), and Mr. A. J. Bond (Aberavon). The Chairman said they were very grateful to Mr. Johns for the facilities provided, and for giving them the opportunity to visit the Morriston Works.

Mr. Johns then delivered the following

ADDRESS.

I understand that the programme of the Educational Scheme of the Institution of Gas Engineers is shortly to be published. Mr. Walter Hole has given details of the scheme to various associations; and if you have not read any reports, you will doubtless be interested in a brief outline of the scheme. The course is of interest principally to those who have just entered, or who are about to enter, the industry. Students are divided into two groups—those who have ample facilities to attend an educational institute which has the approved scheme in operation, and those who have no such facilities. In the first place I will deal with the former group. The course comprises a period of five years, divided into two phases, one of three years and one of two years. During the former phase the student qualifies for the "Ordinary" Certificate; the subjects of study for the first two years being ancillary ones—mathematics, chemistry, &c.—the third year being devoted to gas engineering and/or gas supply. When the "Ordinary" Certificate has been granted, the student qualifies during the second phase for the "Higher" Certificate. The first year of this phase is devoted to further study of ancillary subjects, and the second year to gas engineering and/or gas supply. Upon attaining the age of 23, those students in possession of the "Higher" Certificate may sit for the "Diploma." They are required to have had practical experience, must possess a general educational certificate, such as the Matriculation or an approved equivalent, and must have obtained "Higher" certificates in respect of both gas engineering and gas supply. The Sub-Committee of the Wales and Monmouthshire District Institution appointed to deal with the scheme are considering the question of two centres, one at Cardiff for eastern students, and one at Swansea for western students. In the case of students who are so unfortunately placed that they are unable to attend an educational institute having the approved course, they may study the ancillary subjects at an institution in their neighbourhood, and later, having attained the required proficiency, ask to be examined in gas engineering and/or gas supply. The City and Guilds Examinations will, of course, be open to those who are unable to undertake the course. My object in remarking upon this education scheme is to emphasize the urgency of fitting yourselves to qualify for lucrative posts; as competition is likely to be keener in the future than hitherto.

The Morriston Works.

I understand the principal object of your visit is to inspect the new works at Morriston. They were fully described in my address to the Senior Association, reported in the "Journal" for Nov. 10, 1924; and accordingly I only propose to state a few features of the works, in order to make your inspection more interesting. Ferro-concrete was extensively used. The site, consisting of virgin marsh land, made up to the extent of 7 ft., was a difficult one for the construction of foundations, which consist generally of ferro-concrete slabs supported by piles and beams. The following are also constructed in ferro-concrete: Coal grabbing pit, coal breaker pit, coke crane gantry, coke storage hoppers, tar and liquor well, elevated water tank. The works are laid out for an ultimate capacity of 12 million c.ft. of coal gas and 6 million c.ft. of water gas per diem. In designing No. 1 section of coal gas, the requirements of No. 2 section in regard to subsidiary plant were duly considered; and wherever expedient, plant and buildings have been constructed sufficiently large for such future requirements. The retort house, consisting of 14 beds each of ten retorts of large capacity, is operated on the principal of two shifts per 24 hours; each shift comprising eight hours with intervals of four hours. The retorts are charged and discharged by a Drakes' stoking machine; the discharged coke being delivered into the tube of a "G.N." hot coke transporter which forms a channel to the outside quenching bench. This transporter is also employed for feeding the furnaces; and in this case the tube, after receiving the discharge of coke from a retort, is inclined, to form a channel to the furnace mouth.

The coke is removed from the quenching bench by a crane fitted with a skip of a capacity of two tons. The skip is guided into the trough of the quenching bench, and, imposing its weight upon operating arms, automatically opens the doors of the bench. In this manner the coke feeds from the bench into the skip, which is hoisted by the crane. When the operating arms are relieved of the weight of the skip, the doors of the bench automatically close by the action of counter-balance weights working over pulleys. The coke storage hoppers, yard heap, water gas plant—this is yet to be erected—and the coke separator are set out within the radius of the coke crane; and accordingly transport of all coke, breeze, and ashes may be undertaken by the crane without recourse to separate means of sectional transport.

The engine and power house is constructed for the requirements of two carbonizing units, and embodies: Electrical generators for day and night load; coal gas exhausters; water gas exhausters (not yet installed); tar and liquor pumps; and gas compressors necessary to feed the holders at the works at Oystermouth Road through a 12-in. high-pressure connecting main. The following machinery is operated by electrical power generated on the works: Coal elevators, stoking machine, "G.N." hot coke transporter, coke quenching pumps, coke screening apparatus, coke recovery plant, sulphate of ammonia elevator and centrifugal drier. The steam necessary for driving the electrical sets is obtained from breeze-fired water-tube boilers.

Ammonia and naphthalene extraction are effected in separate rotary brush scrubbers, erected in one group and operated by common duplicate engines; the connections being arranged so that naphthalene extraction is conducted after purification. The purifiers consist of five boxes each 40 ft. square by 6 ft. deep, one of which acts as the catch box. The provision of the patent reverser valves enables the purifiers to be operated on the upward and downward or forward and backward rotation principle, as desired.

The sulphate of ammonia plant consists of a complete equipment for the production of 4 tons of dry neutral sulphate per diem. Neutralizing, by the Hooper and Weyman patent process, is effected by a special feeding device which introduces the correct proportion of alkali in the form of carbonate of ammonia into the basket of a centrifugal drier. Upon discharge from the drier, the sulphate is carried by an elevator to a high point in the building, where it is mechanically screened, and any lumps in the mass reduced to uniformly

granular condition. The sulphate of ammonia crystals fall from this elevation to the stores, and are further dried by exposure to the atmosphere in falling. I particularly recommend those of you who are interested in the manufacture of sulphate of ammonia to examine this plant, as there are very few of its description in operation. After you have inspected the works I shall be only too pleased to answer any inquiries you may wish to make.

A tour of the Morriston Gas-Works was then made under the guidance of Mr. Johns, Mr. Ablett, Mr. Cunniffe, and others on the staff of the Swansea Gas Light Company; the members subsequently adjourning for tea at the invitation of the Chairman and Directors of the Company.

Prof. BACON then delivered the following

ADDRESS.

The lecturer said that the oldest learned society in this country was the Royal Society, which received its charter from Charles II. in 1662. It was before this Society that William Murdoch's paper on the economic employment of gas light from coal was read in 1808, for which he was awarded the Rumford Gold Medal. Of late years, technical societies and technical newspapers had multiplied to a degree which was positively embarrassing. Specialization appeared to be reaching the breaking-point. On the other hand, the inter-dependence of the industries grew greater every year. It was not very long ago that the use of gas was practically confined to domestic and street lighting. According to Sir Arthur Duckham there were now over 3000 known industries in which gas was used, on an average, in seven different processes. Mechanical engineering too had invaded an immense number of industries, and he was sure that they would agree it now played an important part in gas-works practice, as exemplified in the fine new works Mr. Johns had put up at Morriston.

The industrial prosperity of Great Britain had been built up on cheap labour and cheap coal. Neither labour nor fuel were cheap any longer; and the only hope for the future seemed to be in making the most of these now expensive basic commodities by judiciously co-ordinating the fuel producing, transforming, and consuming industries. This was a task which would entail all the scientific knowledge, all the engineering skill, and all the mutual co-operation and goodwill they could command.

The Engineering Department of the University College of Swansea would shortly possess spacious and well-equipped laboratories, the possibilities of which he hoped the local industries, including the gas industry, would exploit to the full. It was the intention to pay special regard to combustion problems. Thanks to the generosity of a firm of water-tube boiler makers, a complete boiler plant was now being installed which would be the most up-to-date experimental plant possessed by any educational institution in the country. It would comprise all the scientific instruments and auxiliaries to enable it to be used as a mighty calorimeter in which fuels could be tested on a commercial scale and under conditions reproducible in industrial plants. He invited the Swansea Gas Light Company to co-operate in enabling him to demonstrate to the industries of the district what could be done in the way of burning gas coke on a chain-grate stoker with mechanical draught, or with natural draught by aid of the "Sandwich" system which Mr. E. W. L. Nicol, of the London Coke Committee, had done so much to develop at Greenwich, Barton, and elsewhere. The combustibility of coke was a live problem for the gas industry as well as for the steam power engineer.

Prof. Bacon concluded by extending an invitation to members to attend the meetings of the Institution of Mechanical Engineers, and also to the Association to pay a visit to their new Laboratories at Singleton.

Mr. JOHNS expressed his gratitude to Prof. Bacon for his address. Referring to the smoke problem, he remarked that the waste taking place, particularly in their own industrial area, was very great, and vast opportunities existed for study in this work.

Mr. D. M. JOHN (Aberdare) proposed a vote of thanks to Prof. Bacon. This was seconded by Mr. T. A. CANNING (Newport).

Mr. B. J. BELL moved a vote of thanks to the Chairman and Directors of the Swansea Gas Light Company and to Mr. Johns, Mr. Ablett, and the members of the staff of the Company who had acted as their guides on the visit to the works. They were grateful to all connected with the Swansea Gas Light Company for the help given, which they highly appreciated.

Mr. T. A. CANNING seconded the vote.

Hull Chemical and Engineering Society.—At a recent meeting of the Society, Mr. N. Simpkin, M.Sc., A.I.C., Director of Research to the Lancashire and Cheshire Coal Research Association, gave a lecture on "Some Aspects of Low-Temperature Carbonization."

PUBLIC LIGHTING BY GAS.

The Work of Messrs. William Sugg & Co., Ltd.

Much about public lighting by gas, together with a good deal of other information that is likely to prove of value to them, was gleaned on Thursday afternoon last by a party of some seventy municipal, county, and lighting engineers, who visited the extensive Westminster Works of Messrs. William Sugg & Co., Ltd. Assembling at the Ranelagh Works, in Chapter Street, they were welcomed by Mr. Philip Sugg, the Chairman of the Company, who devoted himself for the remainder of the afternoon to the guests—as did also the other Directors, Messrs. J. W. Lofts, W. Mattock, and Anthony Sugg.

The inspection was excellently well timed, in mid-week, when everything was in full swing, and the 750 to 800 employees were all busily occupied. That the visitors were astonished at the hive of industry into which they had walked was evident; but that they should have been surprised was only natural. As Mr. Philip Sugg himself said, the works are in a way unique, in that they have been on full time, and sometimes on overtime, for the last four years; and one is inclined to agree with him that such a gratifying state of affairs, on 80 p.ct. gas lighting, indicates that there must be some remarkable awakening in the general attitude towards public lighting. Most municipal engineers and local authorities are, he thinks, now convinced that it is impossible to serve present-day conditions with a standard of lighting applicable to former times. It is no doubt because there has been manifested—largely through the efforts of the lighting engineers—this increased interest on behalf of the public, that the firm have been fortunate enough to keep going full speed ahead over so long a period.

In many of the departments of the factory one would have liked to linger longer; but the tour was a long one, and the time-table had to be adhered to. There was an inspection of the foundry, where brass, gun-metal, iron, and aluminium are cast into various forms for all kinds of lighting components; and the machine shops, where these castings are turned and partially fitted. Then in the automatic shops all kinds of small components are turned wholly or partially by automatic machinery, in the brass finishers' shops other small components are made, and in the stamping shops sheet-metal lamp components are stamped or pressed to shape and sometimes joined together by acetylene welding. As much time as could be spared was devoted to the spinners' shops, in which spinnings of all kinds for lamp casings, reflectors, &c., are made in iron, copper, brass, and aluminium. In addition to the metal polishing shop, the assembly shops, and the tinsmiths' shops, there are testing rooms in which every lamp and burner is adjusted and thoroughly tested before leaving the factory. A department of more than usual interest is to be found in the steatite shops, which are employed in the turning of steatite for use in gas burners and also as insulators for electrical work. There are separate stove shops, in which the manufacture of gas cookers is carried on.

EARLY HISTORY OF THE FIRM.

After tea, Mr. Philip Sugg told the visitors how greatly he and his co-Directors had appreciated the opportunity of showing them round the factory, and explaining to them something of the many processes which went to the making of a gas lamp. The factory had been in course of extension for a great number of years, which accounted for the fact that it was perhaps not quite what one would imagine that a modern factory would be. In a way the firm gloried in this, because it was an indication of the age of the business. It was originally started as a private business, somewhere about 1837, in Marsham Street. That was in the time of his grandfather. It was the son of that Mr. Sugg (and his, the speaker's, father) of whom many of those present had happy memories. A move was made into Vincent Street about 1861, and, as was the custom in those days, Mr. William Sugg lived on the works. In some respects the works which they had seen that day were unique—for one thing, because there were so many processes carried on under one roof. It was seldom that one came across a works so thoroughly self-contained. There was everything there that was required for the production of gas lamps for public and domestic lighting.

PROGRESS IN PUBLIC LIGHTING.

Mr. J. W. LOFTS then lectured, with the aid of a much-admired series of photographic lantern slides, on "Public Lighting by Gas." Pictures were shown of the early gas lamps introduced by Mr. William Sugg, and then of his later designs; the step-by-step development of present-day designs being thus portrayed. He showed clearly the economy to be secured by conversion to the inverted system of lighting, and expressed his surprise that, in spite of this, it is still possible to see in London upright mantles in hundreds, if not in thousands, of cases. "If you want to save the ratepayers' money," he said, "exchange upright burners for inverted fittings." For economy's sake, many thousands of conversion fittings have been, and are being, put into use in all parts of the civilized world—all over these Islands, and also in France, Belgium, Denmark, Norway, Sweden, Egypt, India, China,

Singapore, Australia, South America, and so on. One of the latest countries to take-up conversion fittings is Turkey, where they are giving great satisfaction. Several orders have come from Egypt, where they are so satisfied with them that the process of conversion is becoming general. Two small mantles are, it is found, cheaper to maintain than one universal size. There were many illustrations shown of the well-known "Littleton" lamp, which lends itself to various clusters of burners and styles of fitting.

Mr. C. Chambers Smith proposed a hearty vote of thanks to Mr. Lofts for his lecture, and to Mr. Philip Sugg for his cordial welcome and the visit to what was a remarkable factory. They would all go away with a very good opinion of the firm and of the perfection with which they carried out their work.

Mr. Helford seconded the vote; and Mr. E. F. Spurrell also returned thanks for an enjoyable afternoon. The latter speaker said it was sometimes difficult to induce corporations to pay the price that was necessary to secure a good article; but they must endeavour to get them to buy the best.

Captain W. J. Liberty voiced his personal appreciation of the kindness of the firm in making the visit so pleasant and profitable.

Mr. S. B. Chandler, speaking as a visitor, said the subject which Mr. Lofts had taken for his lecture was one of paramount importance to each one of those present. Street illumination was one of the prime services which undertakings supplying forms of energy for lighting had to deal with; and it was highly important that ratepayers should have the best that was available. The relations of his own undertaking with the engineers and surveyors of the various Councils in the area of supply were of the happiest; and he was very glad to think that the officials in question were at all times willing to listen to proposals in connection with an improvement of the public lighting. This was a highly satisfactory state of affairs; and he submitted that, if they desired to see progress in this direction, they must have co-operation.

Captain H. F. Wilkinson (the Surveyor to the Tottenham Urban District Council) said he appreciated very much the opportunity given to engineers generally of going there and seeing over the works. Those of them who were unacquainted with anything in the shape of manufacturing on the lighting line had had a most interesting time. So far as relations with the gas companies were concerned, he also considered that co-operation was the way to assure success and efficiency.

SOME APPLICATIONS OF THE TOWN GAS FIRED BOILER.

By J. N. Williams.

References to the general subject of utilizing town gas for steam generation have been made from time to time in the "Journal." These references have surveyed the question from the aspects of cost, load factor, capital cost, and reliability. It cannot be claimed to-day that gas, in all circumstances, is superseding solid fuel; but the time is not far distant when this will be the case, for there are most pronounced tendencies in this direction. Having regard to the present cost of various forms of fuel, all one can say is that far more steam should be generated by using town gas, and that for moderate steam requirements under 1000 lbs. per hour, with any degree of intermittency in demand, where labour charges are material, there is a highly satisfactory case for town gas. Every instance must be investigated on its merits; and in this connection there are inflexible rules. Data must be investigated as closely as possible; the "rules-of-thumb" usually associated with steam generation must be forgotten; and, if a steam test is indicated to arrive at actual conditions, then a test must be conducted.

It will probably be of help to those seeking to push gas sales for steam generation if we briefly describe three installations of town gas fired boilers.

Town Gas Fired Boiler for Testing Fittings.

An interesting installation is that at the works of Messrs. J. Hopkinson & Co., Ltd., the well-known manufacturers of boiler fittings. The town gas fired boiler installed at these works is used for testing steam fittings, and has a normal working pressure of 750 lbs. per sq. in. The boiler is horizontal and is fired with a gas jet per tube without primary air, induced draught, or booster. A few particulars of this boiler will be of interest. It is capable of evaporating 343 lbs. of steam per hour from and at 212° Fahr. with 25 ft. of chimney. The diameter of the boiler is 29 in., and the length between tube-plates 4 ft. The shell plate is 1 in. thick, the tube-plates being ¾ in. The boiler has 26 tubes, 12 of which are stay tubes. For this high pressure of 750 lbs. per sq. in. there are three 1⅞ in. diameter stays screwed into the two tube-plates.

On the installation of the boiler, a test was conducted, with the following result:

Working pressure	750 lbs. per sq. in.
Chimney draught	$\frac{1}{10}$ in. water gauge.
Temperature of products	352° Fahr.
Temperature of feed water	47° Fahr.
Town gas	450 B.Th.U. per c.ft. (net).
Water evaporated (actual per hour)	316 lbs.
Water evaporated (from and at 212° Fahr. per hour)	410 lbs.
Gas consumption per hour	1100 c.ft.
Gas per lb. of steam evaporated from and at 212° Fahr.	2·68 c.ft.
Boiler efficiency, unlagged	80 p.ct.

The main advantage of installing a town gas fired boiler for steam testing lies in the fact that, as a rule, the steam demand is intermittent. A batch of valves or fittings is put through together; the testing of these occupying (say) half a day a week.

At a large engineering works in London where the speciality is the overhaul and repair of feed pumps, all the testing is done by means of a town gas fired boiler. Prior to the installation of this unit, a stock of coal had to be accommodated in an already congested site, and the change-over to gas resulted in valuable space becoming available for another important operation. The costing system connected with this pump repair work was carefully organized; and one of the greatest advantages of the gas-fired boiler was found to be that the gas-meter reading gave the actual charge for the steam used in testing the repaired pump. As the steam consumption varied considerably with differing sizes of pumps, this was an important matter.

Town Gas Fired Boilers for Rubber Industry.

Among the many town gas fired boilers installed in connection with rubber process work is a notable installation at the works of the Reliance Rubber Company, Upper Thames Street, E.C. 4. Mr. Fordyce Jones has installed the most up-to-date appliances, and is adopting the most modern methods throughout. The gas-fired steam boiler has an evaporative capacity of 806 lbs. of steam per hour from and at 212° Fahr. The working pressure is from 80 to 100 lbs. per sq. in. Reducing valves bring the pressure down to 15 to 60 lbs. per sq. in. according to the demand for the particular process. The gas-fired boiler is at present supplying steam to a pair of masticating rolls, two vulcanizers, and six presses; and it is estimated the boiler has ample capacity for two additional presses. The main consideration underlying the installation of this boiler was that, owing to the nature of the processes, dust and dirt had to be entirely eliminated. The boiler has been rendered entirely automatic in action, and stand-by charges reduced to the minimum. The automatic regulation of the feed water supply is undertaken by a thermofeed which governs the steam supply to a horizontal duplex boiler feed pump. The gas supply is controlled by an automatic regulator which functions on the boiler pressure.

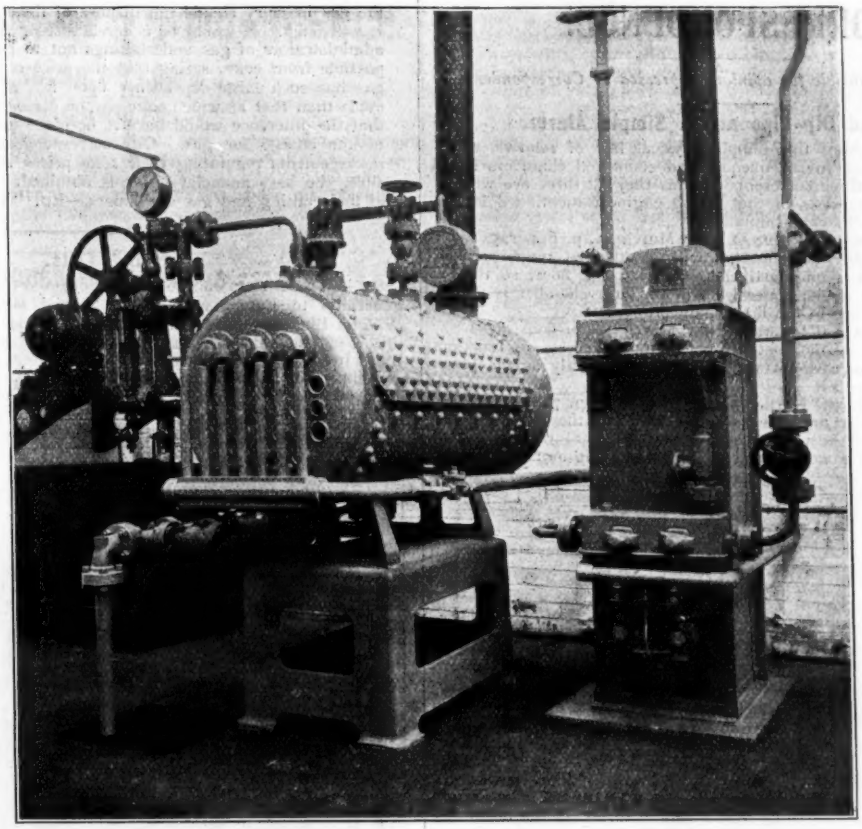
This installation is interesting to those engaged in gas sales, as we here have a case where the success of the works operations depends almost entirely on the elimination of the dirt which is a characteristic of solid fuel firing.

The Heating of the "Capitol" Cinema.

The "Capitol" Cinema, Haymarket, which was opened a few weeks ago, has been hailed by the Press as Europe's "finest and most luxurious cinematograph theatre." It is of interest to note that the "Plenum" heating is entirely dependent on gas-fired units—in this case water heaters. There are numerous unique aspects of this installation. Two boilers are installed on the roof, and as considerable lengths of chimney would have detracted from the architectural features, small induced draught fans were incorporated and sufficient flue pipe supplied to clear the roof of the low boiler house. The fans are each capable of maintaining ¼ in. W.G. Both gas-fired boilers are horizontal; the larger is 3 ft. diameter by 5 ft. 9 in. long, the smaller 2 ft. 3 in. diameter by 5 ft. 6 in. long. Under the draught of ¼ in. W.G. the larger boiler will deliver 1,280,000 B.Th.U. per hour, the smaller 700,000 B.Th.U.

The hot water circulation through the system is effected by a centrifugal pump. Though the boilers are installed on the roof of the "Capitol," the "Plenum" chamber is just above ground level. The cold air enters through a grille in the "Plenum" chamber wall. It first passes over a battery of hot water pipes, is washed, and then passed through the main heating battery. The air volume is computed from a specific allowance per person per hour. Assuming the theatre to be fully occupied, the system which is in commission warms the theatre to a temperature of 60° Fahr. prior to opening; and in warm weather the air volume can be increased and cooled by the air washer to maintain temperature conditions. The distribution of the washed and heated air is made through duct work which delivers the air into the theatre through main grilles and through smaller grilles arranged underneath the seats. The polluted air exhaust is effected through the dome by means of an exhauster fan. The whole heating and ventilating system, which was installed by Messrs. S. Mulliner & Co., Ltd., is so arranged that the air in the theatre is under a slight pressure, so that, in foggy weather, there is no risk of fog invading the auditorium.

The decision to instal town gas fired boilers at the "Capitol"



SPENCER-BONECOURT KIRKE PATENT TOWN GAS FIRED BOILER, INSTALLED AT THE WORKS OF MESSRS. J. HOPKINSON & SONS, LTD., HUDDERSFIELD. THIS BOILER HAS A NORMAL WORKING PRESSURE OF 750 LBS. PER SQ. IN.

and other London cinematograph theatres indicates that this business is well worth cultivation by gas departments.

If a gas proposition is to be really representative, the prevailing conditions must be analyzed closely, if possible in collaboration with a heating engineer. We have known of cases where the gas consumption for a gas-fired boiler has actually been based upon the catalogued duty of a cast-iron sectional boiler, regardless of whether this boiler was too large or too small. For the gas salesman there are immense potentialities in this direction for small industrial steam supplies and heating equipment. The key to the situation is just this: Every inquiry, every opening, must receive the closest analysis. The closer the investigation, the more representative and accurate the data, the better the case for the utilization of town gas.

INSTITUTION OF GAS ENGINEERS.

Programme for the Annual General Meeting, June 9 to 12.

The following is a provisional programme (subject to revision) of the Annual General Meeting, which is to be held in the Great Hall of the Institution of Civil Engineers, Great George Street, Westminster (by courtesy of the Council of that Institution), under the presidency of Mr. J. Ferguson Bell, M.Inst.C.E., General Manager and Chief Engineer to the Derby Gas Light and Coke Company.

Tuesday, June 9.

Morning: Preliminary business. Welcome of delegates from the Continent, &c. Appointment of scrutineers for election of members, associate members, and associates. Address by the President. Annual report of the Council and accounts for year 1924-25. Reports of Education Advisory Committee and the Gas Investigation Committee.

Afternoon: Paper on "The Tankless Gasholder at the Etablissements Arbel, Douai, France," by L. Rolland d'Estape, President of the Société Technique de l'Industrie du Gaz en France (Hon. Member). Discussion. Paper on "The Selection, Design, and Construction of New Carbonizing Plant at Stretford," by W. M. Carr (Member), of Stretford. Discussion.

Evening: Reception and dance at the Connaught Rooms, Great Queen Street, by invitation of the President and Mrs. Bell.

Wednesday, June 10.

Morning: Annual meeting of contributors to the Benevolent Fund. Presentation of the Birmingham Medal to Dr. Charles Carpenter, C.B.E. Reports of the Wrought Iron Tubing Committee, the Joint Refractory Materials Research Committee, the International Commission on Illumination, and the Gas Research Fellowship.

Afternoon: Paper on "Developments in Gas Calorimetry," by Prof. C. V. Boys, F.R.S. (one of the Metropolitan Gas Referees). Discussion.

Thursday, June 11.

Morning: Paper on "Town Gas for Motive Power," by Sir Dugald Clerk, K.B.E., F.R.S. (Past President). Discussion. Paper on "The Economics of Gas Production on the Thermal Basis," by George Evetts, M.Inst.C.E. (Member). Discussion. Election of honorary members. Announcement of election of President, Vice-President, and Council for 1925-26. Concluding business.

Afternoon: Alternative visits: (A) National Physical Laboratory, Teddington. (Limited to 105; ladies may attend.) (B) Fulham Works of the Gas Light and Coke Company, to view plant under course of reconstruction. (C) The Chemical and Physical Laboratories and Burner Department of the South Metropolitan Gas Company, No. 709, Old Kent Road (ladies may attend).

Friday, June 12.

Visit to Derby. (Ladies are invited.) Meet at St. Pancras, at 8.45 a.m., for special non-stop saloon train, leaving at 9.5, due Derby, L.M. & S. Railway Station, 11.37. On arrival at Derby, opportunity will be given to visit (D) the Locomotive Works of the L.M. & S. Railway and the Litchurch Gas-Works, (E) the Carriage and Wagon Works of the L.M. & S. Railway and the Litchurch Gas-Works, (F) the Gas Offices, Showrooms, and Cavendish Street Gas-Works, or (G) the Royal Crown Porcelain Works, Osmaston Road, Derby (this visit is intended for ladies only).

Luncheon in the Assembly Rooms, Market Place, by invitation of the Chairman and Directors of the Derby Gas Light and Coke Company, at 1.15 p.m., to be followed by a motor coach drive to Haddon Hall, where tea will be provided, returning to Derby by 7 o'clock for the 7.12 special non-stop saloon train back to St. Pancras, due to arrive at 9.47. Light refreshments will be available on the down journey to Derby, and dinner on the return journey to London.

The President's staff will be pleased to advise and arrange for hotel or hydro accommodation on behalf of those desirous of extending their visit beyond the Friday, upon receipt of particulars of requirements, addressed to—Mr. J. Ferguson Bell, Gas Offices, Friar Gate, Derby.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Unsealed Dip-Pipe and a Simple Alarm.

SIR,—How confusing this simple physical law of relative water levels due to vacuum in the unequal and connected chambers is, is borne out by your three correspondents, as they all three are wrong. Therefore, in the interests of that young engineer mentioned in the case, I crave space in your columns.

Correspondent No. 1 ("JOURNAL" for March 11, p. 614) says:

"This chamber is connected with another of much smaller area (viz., 4 to 1 on illustration) containing a float, so that a small variation in the water level in the first chamber is multiplied several times in the float chamber."

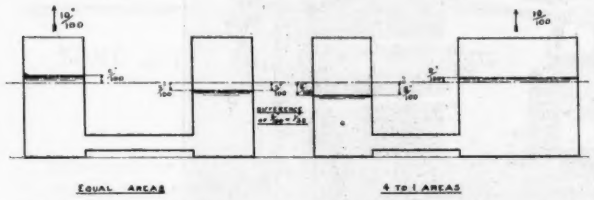
Correspondent No. 2 ("JOURNAL" for March 18, p. 690) says:

"The motion of the float will not be multiplied by any function of the relative areas, but will be governed exactly as the pressures."

Correspondent No. 3 ("JOURNAL" for March 25, p. 748) says:

"If the relative areas be as 4 to 1, actually there would be a magnification of the movements of the float of 1¼ times."

The diagram shows two connected chambers having areas as 4 to 1,



and also two connected chambers of equal areas; and from the diagram it is easy to see that, with a fluctuation of one-tenth in the vacuum from the hydraulic mains, the descent of the float with the equal chambers will be 0·05 in., and the descent of the float with the 4 to 1 unequal chambers will be 0·08 in. Thus the increase of lift due to unequal chambers is but 0·03 in. = 1/32 in., or a gain in motion of float so infinitesimally small as in no sense to warrant the adoption of unequal chambers, and so small that it totally disproves the meaning of the statement "multiplied several times."

Further, the *raison d'être* of this ingenious piece of apparatus being to increase the motion of the float, the illustration will help to show:

(1) The gain in lift for 1/10 in. change of hydraulic main vacuum (*i.e.*, the stated sensitiveness of the instrument) is but 1/40 in.

(2) The 1¼ times increased lift stated by No. 2 correspondent should be 1⅜ times.

(3) The lift of the float, if the relative areas of the chambers be increased a thousandfold, can never be doubled, to say nothing of multiplied *several* times.

FLORET QUI LABORAT.

March 26, 1925.

The Price of Coke.

SIR,—I have just received a notice from my Gas Company which informs me that they intend to increase the price of gas by an amount equivalent to approximately 10 p.ct. as and from the beginning of the Lady Day quarter. I believe this has happened, or is happening, generally. One of the reasons they advance for this increase in price is the fact that "a considerable fall in the market prices of the important residuals coke and tar has taken place."

There appears to my mind to be an enormous disproportion between the selling price of coal and that of coke. It is fairly common to find coke priced by gas companies at a figure per ton slightly in excess of that prevailing for coal in the same area. While taking into account the fact that one gets about twice the volume of coke per ton (compared with coal) there still seems to me to be an excessive charge made for material which must—from considerations of space—be regularly removed from gas-works.

Though I write as an engineer connected with a firm of contractors who do considerable business in supplying and installing coal and coke handling and gas-making plant, I fully realize there may be a flaw—of a very elementary nature—in my views. Through the medium of your columns, and by your courtesy, I therefore invite criticism on this subject, as, at the present prices, coke does not seem to me to be an attractive proposition for householders. Knowing the sliding-scale principle which is applied to gas companies' dividends, I do not suggest the threadbare charge of "profiteering."

INTERESTED.

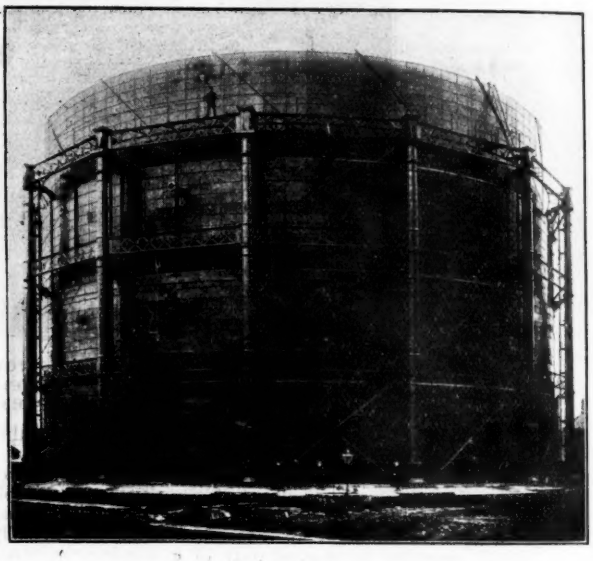
March 27, 1925.

[The foregoing letter would not have been published in the "JOURNAL" had it not been written by an engineer connected with contractors supplying coal and coke handling and gas-making plant. The letter appears to have been instigated by a notice as to an increase in the price of gas, and by the reason attributed being the fall in the market prices of secondary products. The object of the letter appears to be to advocate lower prices for coke; and this shows a direction in which lies the interest of our correspondent. The prices that are now being charged for coke are considerably lower than they were a short time ago. We see that the Gas Light and Coke Company on the day this note is being written are advertising unbroken coke at 41s. 2d. per ton and broken at 43s. 4d. per ton, delivered free within three miles of the Company's works. This compares well with the retail price of smoke-producing coal of approximately equal calorific value. The price of coke in the gas industry is regulated by the law of supply and demand, and the demand is influenced largely by the relative values of competing fuels. We fail to understand why the gas industry should not dispose of their coke at the best price it will fetch. It would be a dereliction of duty on the part of the administrators of gas undertakings not to get as much revenue as possible from coke, seeing that the price of their primary product gas has such large dependence upon it. If a lower charge were made than that at which coke can be disposed of to-day, it follows that the difference would have to be made up by a further increase of the charge for gas. Our correspondent may rely upon gas managements regulating their coke prices so that, as far as possible, the best financial result is obtained, to the mutual interest of undertaking and gas consumers.—ED. "G.J."]

Flying Lifts.

SIR,—We desire to call your attention, and that of the gas industry generally, to Patent No. 229,128, dated Feb. 19, 1925, by Mr. William Blakeley, for the application of the spiral system to "flying lifts" of guide-framed gasholders (new or extended), extracted in the "JOURNAL" for March 18, p. 691.

Seeing that as far back as 1893 we successfully extended a 124 ft. diameter two-lift guide-framed holder at Rotherham to four lifts, the top or "flying" lift being on the spiral system, and that this gasholder is still in constant use, we are naturally opposing this patent.



The Flying Lift on the Rotherham Holder.

Further, we are even now approaching completion of the extension of a large holder of 2 million c.ft. capacity of two lifts to a four lift of 4 million c.ft. capacity, by the addition of one tier to the guide framing and two more lifts to the holder; the top or "flying" lift being on the spiral system.

WESTWOOD & WRIGHTS, LTD.

Brierley Hill, March 30, 1925.

[As far as recollection goes, our first introduction to flying lifts was in connection with the large East Greenwich holder of the South Metropolitan Gas Company in 1892, but this was not spirally guided.—ED. "G.J."]

Explosion of Electrically-Generated Gas.

SIR,—I notice in your issue for March 25 that you refer to an explosion at Acton, which you state was caused by an explosion of gas. I think it would be well to point out to you that this explosion was not in any way connected with the gas supplied by my Company. It was caused by the fusing of a long length of electric cable, which gasified some of the bitumen coating. It was the gas generated from this that was the cause of the trouble. Coal gas or the Gas Company are not in any way concerned.

As so many of the daily papers have fallen into the error of attributing this explosion to coal gas, I would be glad if you could give publicity to the particulars now supplied.

G. L. JENNINGS.

The Brentford Gas Company,
March 26, 1925.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 25.]

Nos. 7005-7711.

BERRIDGE, J.—"Means for utilization of waste products of combustion." No. 7559.

DAVIS, H. N.—"Gas cookers." No. 7611.

HELPS, G.—"Hotplates and gas cookers." No. 7517.

KOPPERS COMPANY.—"Treating spent liquids of liquid gas purification." No. 7711.

LILGE, F.—"Gas furnace." No. 7619.

RADIATION, LTD.—See Davis, H. N. No. 7611.

SIMPSON, S.—"Coin-freed gas meters." Nos. 7197, 7198.

TWIGG, W. R.—See Davis, H. N. No. 7611.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Reported from the Select Committee, with amendments: Horley District Gas Company (Electricity Supply) Bill and Rochdale Corporation Bill.

Select Committees have been appointed to consider the Blackpool Improvement Bill and the Oldham Corporation Bill, and will meet on Wednesday, May 6.

HOUSE OF COMMONS.

Progress of Bills.

Bolton Corporation Bill: Reported, with amendments, from the Local Legislation Committee.

Gas Regulation Act.

Copies were presented to both Houses of drafts of Special Order proposed to be made by the Board of Trade under section 10 of the Act, on the application of the Monmouth Gas and Water Works Company, Ltd.

In the House of Lords, on the motion of Viscount Peel, the draft Special Orders relating to the Biggleswade and District Gas Company, Ltd., and the Welwyn, Knebworth, and District Gas Company, Ltd., were agreed to. In the case of the latter Company, the following modifications were made:

Clause 20 (p. 9) after the words "transfer shall" insert the words "except so far as such Acts and Orders are repealed or amended and".

Clause 20 (p. 9) omit the words "continue to apply to the undertaking after that date," and insert "apply to the whole undertaking of the Welwyn Company."

Clause 44 (p. 23) after the words "Section 12 (power to purchase additional gas loads)" insert "Section 15 (amending obligations as to supply of gas)."

These Orders, together with that for the Teignmouth Urban District Council, were approved by the House of Commons, on the motion of Sir Burton Chadwick.

GAS LIGHT AND COKE COMPANY'S BILL.

HOUSE OF COMMONS COMMITTEE—Thursday, March 26.

The main provision of this Bill is to transfer the undertaking of the Brentford Gas Company to the Gas Light and Coke Company.

(See "JOURNAL" for Jan. 7, p. 30.)

Counsel for the Bill were Mr. H. P. MACMILLAN, K.C., Sir LYNDEN MACASSEY, K.C., Mr. W. E. TYLDESLEY JONES, K.C., and Mr. F. J. WROTTESLEY. The only petitioners appearing were the Alkali Manufacturers' Association, who were represented by Mr. W. CRAIG HENDERSON, K.C.

Other petitioners named were the London County Council and the Harrow-on-the Hill Urban District Council, but there was no appearance.

Mr. H. P. MACMILLAN, K.C., opening the case for the Bill, said he did not need to say much in introducing the Gas Light and Coke Company to any Committee of the House of Commons, as it was one of the best known public bodies in this country. The history of the Company, like that of many other public undertakings, had been a history of successive amalgamations and absorptions. The public interest had undoubtedly been served by the fact that gas could be supplied more cheaply when manufactured in bulk. Between 1870 and 1922 no fewer than eleven undertakings had been merged in the main Company, which now supplied about 950,000 consumers. The total capital at present was approximately £29,763,000, and the dividends were regulated by the sliding-scale.

The main purpose of the present Bill was to obtain the sanction of Parliament to the transfer of the Brentford Company to the Gas Light and Coke Company, under the terms of an agreement entered into between the parties on July 25, 1924. The agreement had been approved by both Companies, and everything, therefore, was in order. Though the area proposed to be incorporated was large in extent, it was, in parts, different in character from the other territory of the Gas Light and Coke Company.

The proposals of the Bill had been subjected to the most searching scrutiny on the part of the numerous local authorities concerned. There were no less than 35 petitioners against the measure originally, but Mr. Craig Henderson, K.C., was the sole survivor of that large—he must not say that motley—army. Great local interests were involved, and the local authorities concerned had deposited their petitions for the purpose of watching the progress of the Bill and seeing that appropriate clauses were adjusted. They were all, in effect, satisfied, as was apparent from the small list of appearances before the Committee. The Bill had survived an unusual amount of scrutiny. Accordingly, no one appeared to challenge the expediency, in the public interest, of the amalgamation. The terms as between the shareholders and debenture holders of the two Companies were satisfactory to them and were embodied in the Bill; and the only point to be determined by the Committee was that raised by the Alkali Manufacturers' Association, relating to the clauses applying the provisions of the Gas Light and Coke Company's Acts and Orders to the limits of supply as extended by the Bill, repealing certain enactments of the Brentford Company, and transferring to the Gas Light Company the unrepealed enactments. The Brentford Company, said Counsel, had its own series of Acts and Orders, but now that it was to be merged in the undertaking of the Gas Light Company, the consolidation of the two systems must be effected, and the Brentford Company had to be brought within the code of the Gas Light Company in order to produce a uniform code operating throughout the whole district. The clauses in question provided that the existing code of the Gas Light Company should, immediately after the transfer, become applicable to the extended sphere of the Company. The enactments of the Brentford Company to be repealed were set out in a schedule to the Bill. One of the sections of the Brentford Gas Order of 1924, part of which it was proposed to repeal, was section 37, which gave power to use lands for the manufacture and storage of gas. The Alkali Manufacturers' Association asked the Committee to save from repeal sub-section (2) of that section which the Bill proposed should be repealed, and to make it part of the code of the Gas Light Company in so far as it affected the district of the Brentford Company.

Section 37 (2) of the Brentford Order of 1924 is as follows:

"The Brentford Company may also:

"(A) Purchase the residual products arising from the manufacture of gas by other gas undertakers and (on any lands upon which the Brentford Company are for the time being authorized to work-up and convert their own residual products) work-up and convert such purchased residual products, and therewith manufacture other products of the same kind as the Brentford Company are manufacturing from their own residual products. Provided that the quantity of any residual product so purchased by the Brentford Company in any year shall not exceed one-third of the quantity of the like residual product which shall in that year arise directly or indirectly from the manufacture of gas by them; and

"(B) purchase from other gas undertakers and elsewhere, and use, the materials required to work-up and convert the residual products so arising from their own manufacture of gas, or purchased as aforesaid.

"But the Brentford Company shall not manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings, or in the manufacture of which the use of residual products produced by the Brentford Company or purchased from other gas undertakings is merely subsidiary."

The request of the Alkali Manufacturers' Association, said Counsel, was founded upon a complete misapprehension of the situation. So far as the Gas Light and Coke Company were concerned, they did not want any power, either in themselves or in the Brentford Company after they had taken that over, to purchase residuals from anybody else, because it was not the practice of the Gas Light Company to buy residuals from other undertakings; nor had they the power to do so, except that they could buy residuals for working-up their own residuals.

Speaking of the controversy which had existed as to whether it was right and proper for gas undertakers to buy residuals from other gas undertakers, Counsel said that the operations of gas undertakings had been very jealously watched by the heavy chemical trade, who considered that the gas undertakers were to some extent poaching on their preserves, because they were dealing with the working-up of materials into marketable products. The genesis of this practice of purchasing residuals not produced in the undertaking itself was that in small works it did not pay to set up a plant to work-up these residuals and to dispose of them; and the practice had grown of collecting residuals from a number of gas plants. Exception was taken, however, by the Alkali Manufacturers' Association to any gas undertaking handling more than its own residuals. The Association had sought to have every undertaking working in a water-tight compartment, which was a very serious restriction upon small undertakings, and, in effect, would have prevented them from disposing economically of their residuals. Counsel then referred to a number of Bills before Parliament before 1912 in which gas undertakers sought powers to purchase residuals from other gas concerns. This had aroused the vigilance of the Alkali Manufacturers' Association, and in the result a Joint Committee of both Houses of Parliament in 1912 had considered the trend of legislation on this question. The outcome of the inquiry by this Committee was that, where power was given to purchase residuals from other gas undertakers, this power should be limited to one-third of the amount produced by the purchasing undertaker. That restriction was placed upon the Brentford Company under their Order of 1924.

Why the Alkali Manufacturers' Association wanted that power retained by the Gas Light Company, in so far as the Brentford area was concerned, he did not know. The Gas Light Company had not that power in their present area. For some reason, the Association were trying to force upon the Company a power they did not want; but it was not the practice of Parliament to do this.

Until 1924, when the Brentford Company purchased the Harrow and the Richmond Gas Companies, the Brentford Company had unlimited powers to purchase residuals from other undertakers; but in 1924 that power was limited to one-third of the amount manufactured by themselves, on the representation of the Alkali Manufacturers' Association. The Gas Light and Coke Company resented the present suggestion that this power should be retained in so far as the Brentford area was concerned when they did not want it. In the first place, it was inconsistent with the policy of the Gas Light and Coke Company in the past. In 1922 they had taken over the undertaking of the Ilford Gas Company, who had powers to purchase residuals up to one-third; but this power was repealed when it was merged in the Gas Light and Coke Company. Again, if the power was retained in respect of the Brentford area, it would be difficult to work, because the Brentford output of residuals would have lost its identity completely when the area was taken over. It was part of the advantages of these amalgamations that the gas would be made at the most convenient place, and the gas supplied in the Brentford area would not necessarily be made in that area. How could it be said, therefore, what proportion of the total residuals represented the Brentford residuals? The Gas Light and Coke Company did not want a differential code applying to any part of its area.

Asked whether it would not be the same thing if the Gas Light and Coke Company accepted the power, but did not use it, Counsel reiterated that it would produce confusion in the Company's code. The logical course was that, if the Committee sanctioned the amalgamation, it should be sanctioned on the basis that the Brentford undertaking came into the code of the Gas Light Company.

Continuing, Counsel said that the Alkali Manufacturers were

naturally not really anxious that the Company should have power to purchase residuals from other undertakings, but were more interested in the proviso, which stated that the Brentford Company should not manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings, or in the manufacture of which the use of residual products produced by the Company or purchased from other gas undertakings was merely subsidiary. He believed that what the alkali manufacturers really wanted to do was to have that proviso edged into the constitution of the Gas Light Company, to whom it did not apply at the moment. It was merely stated in the petition that the clause should be preserved, with its restriction; but as the proposal of the Bill was that the clause should be repealed, in order to bring the Brentford undertaking within the general code of the Gas Light Company, the alkali manufacturers could not object. They had failed to disclose any manner in which they would be injuriously affected. In looking around for a reason as to why they had put this petition forward, he said he remembered that the Alkali Manufacturers' Association were at present in litigation with the Gas Light and Coke Company, and he could only surmise that that litigation and the present proceedings had a connection. Mr. Deuchar, the Secretary of the Castner-Kellner Company (who were members of the Alkali Manufacturers' Association), had bought shares in the Gas Light and Coke Company in order to bring litigation against them, and this litigation was started for the purpose of stopping the Company making caustic soda for the purpose of working-up their own residuals. The High Court and the Court of Appeal had both held that the Company had power to make caustic soda, but only for the purpose of working-up their own residuals; and the matter had been taken to the House of Lords. It seemed to him, therefore, that this petition was possibly deposited with a desire to obtain an advantage in connection with that litigation. The purpose of the Alkali Manufacturers' Association was to impose upon the Gas Light Company the proviso already mentioned, the meaning of which was that the Company should not encroach upon the chemical trade at large.

Mr. *D. Milne Watson* (Governor of the Gas Light and Coke Company) gave evidence, and said that the terms of the Bill were satisfactory to all concerned. The Gas Light and Coke Company had no wish to purchase residuals from outside. They had already sufficient supplies of their own; and further, he had been advised that in law the Company had no power to do so. The power to purchase from outside was absolutely foreign to the code on which the Company had carried on business; and it would be embarrassing to them, inasmuch as, after the amalgamation, the gas flowed from the various works in all directions. The gas supplied in Brentford would not necessarily be made in Brentford, and they could not differentiate between the Brentford part of the business and the remainder.

Asked by a member of the Committee how the Company would be embarrassed if they had the power but did not use it, Mr. Milne Watson admitted that, if the Company accepted the clause, it would have the effect of reducing their powers in another direction. The Company had spent large sums of money on the faith of the powers granted them by Parliament, and those powers had been upheld in the Law Courts. If the restriction contained in the clause in question was placed upon the Company, they would find it embarrassing in carrying on the businesses they were at present entitled to carry on. The proviso which would preclude the Company from manufacturing chemicals exclusively from raw materials purchased from sources other than gas undertakings would prevent the Company manufacturing caustic soda used for working-up their residuals.

Mr. MACMILLAN, in the course of his examination of Mr. Milne Watson, said that, if the Alkali Manufacturers' Association had said that they wanted to retain the advantage embodied in the proviso referred to, they should have treated the Committee with candour. It was apparently hoped, he supposed, that the members of the Committee, in their simplicity—if he might say so—would be induced to put a clause into the Bill which would give the Alkali Manufacturers an advantage entirely remote from what had been disclosed. This was not the way to treat any Parliamentary Committee, or Parliament, and he suggested that the reward of the Alkali Manufacturers should be that they should be driven from the seat of judgment.

Witness, replying to Mr. CRAIG HENDERSON, who cross-examined, agreed that the Company had power to purchase materials for working-up their own residuals elsewhere than from other gas undertakings; and he wished to retain this power.

COUNSEL pointed out that the clause at present applying to the Brentford area gave power to purchase from other gas undertakings and elsewhere materials required to convert their own residuals. Counsel then classified residuals into three groups: (1) Ammoniacal liquor; (2) tar; and (3) spent oxide. These were used in the manufacture of chemicals; and what had given rise to the dispute in 1912 was that the chemical manufacturers of the country had to look to gas undertakings mainly for their raw materials.

Witness said that if Counsel put it in this way, he might point out that, as the gas companies purchased the coal, and the bye-products came from the gas undertaking, he had always failed to see that there was an inherent right to any outside party to say that the gas companies should hand over these products for that outside party to deal in.

COUNSEL said that Parliament had imposed these restrictions. The gas companies were granted monopolies over large areas for the supply of gas, and were created to manufacture and supply gas in their areas. He referred to residuals as a "happy accident" in the manufacture of gas.

Witness would not accept this, and said he believed that the original object of the gas companies was to recover the bye-products. There had followed the use of gas, which had ultimately become the more important.

COUNSEL said that the main object was to supply gas to the community, and if the main object were the supply of chemicals there would be no reason for a monopoly.

Witness replied that when the gas industry first started there was no monopoly, and companies were operating in competition; but, owing to the difficulties resulting in connection with the pulling-up of streets, &c., monopolies were granted.

In the course of further discussion, Counsel said it had been admitted in the past that the Gas Light and Coke Company had bought residuals from other companies, and, therefore, those purchases were illegal. Mr. Milne Watson admitted that it had been done some years ago, but on a very small scale, and it had now been ascertained definitely that there was no power. It was not done at present.

Mr. MACMILLAN said that a legal opinion had been obtained; and the statement of the advisers was: "We do not think the Company have any power to purchase the residuals of other gas undertakers except in so far as the materials purchased may be required for the purpose of working-up the residuals resulting from the Gas Company's own manufacture of gas."

Mr. CRAIG HENDERSON said that, whatever the powers of the Company might be, which had up to now been exercised within their area, they were now seeking to apply them to the Brentford area. This meant a very considerable addition to the area of supply.

Mr. *Milne Watson* said it was a considerable addition of green fields.

COUNSEL said it was a territory ripe for development, with some rare and refreshing fruit for the Gas Company, and in due time they hoped to get it. He understood the case was that, merely because the absorbing company happened to be the Gas Light and Coke Company, the rights within the Brentford territory should be increased by Parliament.

Witness replied that, if the clause as it stood were applied to the Company, it would give them the right to purchase more residuals so far as the Brentford area was concerned. But he did not want this power, and, therefore, he was a friend of the alkali manufacturers.

Mr. CRAIG HENDERSON then pointed out that, while in the Bill various Brentford enactments were expressly repealed, there was saved from repeal a clause in the Brentford Order of 1881 which gave the Brentford Company unlimited power to purchase residuals.

Mr. F. J. WROTTESLEY (for the promoters) said that, if this were the case, he was not aware of it; and it was certainly not intended. If there was any doubt about it, it would be made clear. It had not been mentioned in the petition, however.

Answering further questions, Mr. Milne Watson said that the Gas Light and Coke Company did manufacture chemicals exclusively from raw materials purchased from sources other than gas undertakings, but to a limited extent. They only manufactured such quantities as they needed. They had also manufactured chemicals in the manufacture of which the use of residual products was merely subsidiary, to a limited extent; but he was informed that at the present moment they were not manufacturing anything.

Asked if the clause in question had not been inserted in nearly all the Acts passed by Parliament since 1914, Mr. Milne Watson would not admit this. It had, he said, been put in some. He considered it wrong that a Company who were only carrying on their own work should be asked to give up their powers in part of their district.

This concluded the evidence.

Mr. WROTTESLEY, at this point, said it was right that the 1881 Order of the Brentford Company contained a clause enabling them to "deal in" coal tar products and various other products. It was necessary to retain the operative part of this clause, however, because its object was to enable the Company to use certain lands for gas manufacture. It had not been realized that the power to "deal in" residuals remained; but he would undertake that those words and words of a similar kind would be deleted.

Mr. CRAIG HENDERSON, addressing the Committee, said that the Gas Light and Coke Company had been fortunate enough to obtain powers of a fairly wide character, which had enabled them to carry on an extensive manufacture of chemicals for converting their own residual products. If the Company were coming to Parliament to-day for the first time, in order to get powers, they would not be in the happy position they were in in 1868, when they obtained their consolidating Act. They would have to face the fact that ever since 1912 there had been followed the declared policy of Parliament, that restrictions should be placed upon gas companies, so that, being protected under a statutory monopoly, and having great advantages with regard to the supply of gas, they should not at the same time become competitors with other people outside who had not a monopoly of that character. As to the position of the Brentford Company, he said that only a year ago they were a smaller undertaking than at present. Last year the Company had absorbed the Harrow and the Richmond Companies, and, as the result of opposition by the Alkali Manufacturers' Association, they had had imposed upon them the model clause. Thus, only twelve months ago, this restriction, which was the declared policy of Parliament, was made to apply to this area. The Gas Light and Coke Company now came to Parliament for sanction to an agreement to absorb the Brentford Company, and, having obtained their powers under an old Act, had asked that they should be given the Brentford area free from the restrictions which Parliament had imposed upon them. Why should Parliament do this? Why could not the Gas Light and Coke Company take the Brentford area as it was? It was said that the Company had no power to purchase residuals from other gas undertakers except for the purpose of converting their own residuals; but this was a very wide power. The Company's output of gas and of residuals was enormous, and it had a huge chemical undertaking quite apart from gas supply. If there would be any difficulty, as was suggested, in working one part of the amalgamated area with another, the one part being subject to a restriction not applying to the other, then this was a very good reason for not allowing the amalgamation. Having regard to the whole of the legislation upon the subject, if the Gas Light and Coke Company were to have powers in the Brentford area extended beyond what the Brentford Company had, they should be required to prove to the Committee a very strong case. The only thing that handicapped the Company by the application of the clause in question was the proviso at the end. This, however, did not apply to the existing area of the Gas Light and Coke Company, but only to the Brentford area—the rich territory which was to be added to the Company's present area. He asked the Committee not to depart from what had been the declared policy of Parliament.

As the result of questions put by the Chairman of the Committee with regard to what happened when the Gas Light and Coke Com-

pany took over the undertaking of the Ilford Gas Company, Mr. Wrottesley handed in copies of the Ilford Gas Order of 1920, and the Gas Light and Coke Company's Order of 1922. The latter repealed the Ilford Gas Order of 1920, except the schedule and so much of section 31 as related to the lands described in that schedule—in other words, so much as allowed the manufacture of gas on those lands. This was exactly what the Gas Light and Coke Company asked the Committee to do in this case.

Mr. Craig Henderson asked if there were opposition in the Ilford case.

Sir Lynden Macassey replied that, however that might be, it represented the policy of Parliament.

After deliberating in private, the Committee decided to pass the preamble of the Bill.

Monday, March 30.

The clauses of the Bill, as amended, were approved by the Committee. In accordance with the statement made by Counsel for the Company during the proceedings on Thursday, a clause was inserted to make it clear that nothing in the Bill should confer any further powers upon the Company with regard to residuals. Originally there were clauses in the Bill enabling the Company to supply power gas (see "Journal" for Jan. 7, p. 30), but these have been withdrawn by agreement between the Company and the various local authorities. There are protection clauses in favour of the London County Council, with regard to streets and buildings; the Metropolitan Water Board, relating to the protection of their apparatus; and the Harrow-on-the-Hill Urban District Council, relating to the closing of a footpath. These clauses are in the ordinary form.

HORLEY DISTRICT GAS (ELECTRICITY SUPPLY) BILL.

(*Continued from p.* 750.)

Friday, March 20.

Mr. Tyldesley Jones, cross-examining Mr. Broadberry, said that what was called waste heat was not really waste heat, because in up-to-date works it was utilized for the purposes of the works. He put it to witness that in up-to-date gas-works, where the proper appliances had been installed, there was no more heat generated than was required by the gas-works for its own purposes.

Witness admitted that this was probably correct. There would likely be some spare power after satisfying the demands of the works, but it would not amount to a great deal. As to the Horley Works, he said they were comparatively small, but he would not admit that they were out-of-date. For a works of their size, they were efficient. He agreed that the Company had not utilized the waste heat in their works up to the present time, and admitted that this would make a difference in the cost of production of gas, but not a very material one.

Counsel suggested that the present proposal to utilize the waste heat was rather belated. Coming to the statement made by Mr. Broadberry on the previous day, that the Tottenham District Light, Heat and Power Company had supplied electricity in Wood Green at a price comparable with that charged by the North Metropolitan Electric Power Supply Company, and by the Borough of Hornsey (who were supplying in adjoining areas), he referred to the London County Council statistics of the electrical undertakings of London, showing the costs of generation and the prices charged by these three undertakings, and pointed out that the cost of, and charges for, electricity were lower in 1921, 1922, and 1923, in the case of the North Metropolitan Company and the Borough of Hornsey, than in the case of the Tottenham Company, though the two former undertakings were separate electricity undertakings, and in the latter case the Company supplied both gas and electricity.

Witness said that what he wanted to point out was that Wood Green was a case in which no independent company could have carried out the public supply of electricity to the same advantage as it had been carried out under the fostering care of the Gas Company.

Counsel said the figures did not prove this.

Witness replied that he thought they did.

Counsel maintained that the figures showed exactly the contrary. Coming to the statement that, in a general sense, gas represented heat, and electricity represented light, he said that this showed the attitude of a gas company towards electricity supply. He went on to ask if it had not been put before Parliament over and over again that, if the electricity undertakings could develop a day load, by increasing its use for power purposes, they would be able to develop electricity for lighting purposes far more cheaply than if the machinery at the power stations were used only during the short lighting period; it was only by doing their utmost to develop the use of electricity for power during the day that they could hope to cheapen the price of electricity for lighting at night.

Witness said that might be so; but God help the electricity companies if ever they got the cooking load!

In answer to further questions, witness said that a considerable amount of electricity was used for cooking purposes, but there were very few electric cookers in use anywhere around North London. Asked why, he said it was because it was so much cheaper and more beneficial to cook by gas. Electricity could not compete with gas for cooking purposes. He regarded small industrial power purposes, however, as being a suitable application for electricity. Asked if, assuming there were a demand in Horley for electric power for small machinery, electricity would be more suitable for it than gas, he said that in all probability it would, especially if the machinery had to be used intermittently.

Counsel said that the views of the Horley Gas Company were exactly the opposite to that. He quoted from a letter written to the Reigate Rural District Council on Jan. 5, 1925, in which it was stated that the obvious conclusion to be drawn from the long lists of precedents was that Parliament in its wisdom considered that any possible competition, which was the only argument for separate control, between a gas company and an electricity company, was nowadays really negligible. He asked witness whether he agreed that competition between gas and electricity companies to-day was almost negligible.

Witness would not say it was negligible; the two industries were going ahead side by side.

Counsel said that competitors generally ran side by side until one of them got ahead.

Witness replied that gas had been ahead for a long time.

Counsel: And you mean to keep it ahead by every possible means.

Witness did not agree.

Counsel said that the letter referred to went on to state that the competition was negligible for the reason that by far the greater and ever-increasing proportion—in the Horley case 60 p.ct.—of the total output of gas was used for cooking and for domestic heating and small power purposes, in which kind of service electricity, in a district such as Horley, could never compete with gas. He asked if witness agreed with that.

Witness replied that he did not agree so far as small power units were concerned, especially if used intermittently.

Dealing with statements which had been made that, if competition between gas and electricity undertakings were eliminated, economies would result, Counsel ascertained that the number of units supplied per head of population in Wood Green in 1924 was 20; and witness agreed with him that towns of the same size as Wood Green had an average consumption of 50 units per head, where two competing undertakings were operating. Counsel went on to say that the average consumption per head in England was 200, but it was only fair to say that this included large industrial districts, where an enormous amount of electrical energy was used for power, traction, and so on.

Witness said there was no demand for large power purposes in Wood Green, but the consumption per head would reach 50 units before long.

Mr. *G. M. Gill* (Consulting Engineer) said there were considerable advantages arising from the placing of the supply of gas and electricity in the hands of the one concern in a small district such as Horley. Enumerating some of these advantages, he said that it was possible to put down electrical plant in the gas-works and so avoid the necessity for procuring a new site. Horley Gas-Works had a railway siding, and this was somewhat difficult to get on a new site. There would also be a saving in rates and taxes, and there would be common offices, transport facilities, a common weigh-bridge, workshops, &c. There were also advantages on the administrative side, because the Directors, the managing staff, clerks, collectors, canvassers, mechanics, storekeepers, and so on, would be able to attend to the two organizations.

With regard to the statement made by Mr. Tyldesley Jones that there was scope for the use of all the power that could be generated from waste heat at the gas-works themselves, witness said that the Horley Works were small, and a works of that size did not employ power to anything like the extent that a large works would. For instance, at Horley there were no stoking machines or coal and coke handling plant, and this was a general state of affairs in works of that size. In a small works the waste heat would be available for external purposes, and in a large works a great deal of it could be used for internal purposes. As to the condition of the Horley Works, it was a very fair average for works of that size; he had inspected the works, and had seen nothing which he would have condemned. The amount of waste heat at Horley was about the same as would be found at other works of that size. In the winter months there was an amount of waste heat which should generate something over 900 lbs. of steam per hour. The temperature of the waste gases at the point where they would enter the waste-heat boiler was something over 500° C. Answering further questions on the point of competition, he said it was not good for the consumers in a small district such as Horley. Elsewhere it was, up to a point; there were advantages on both sides.

Mr. Tyldesley Jones suggested that, before electricity was used for lighting, there was no attempt by the gas companies to substitute the incandescent burner for the old flat-flame burner, and said that it was after the introduction of electric lighting, and in consequence of competition, that the improved methods in the gas industry were introduced.

Witness had his doubts.

Counsel said that, whatever might be the future policy of the gas and electrical industries, whatever combinations might come about, the consumer had benefited very materially indeed from the competition which had of late years existed between gas and electricity; and, had it not been for the advent of electricity, the gas industry might not have been in the proud position it occupied to-day.

Witness would not go so far as that.

Counsel, with regard to the utilization of waste heat in small gas-works, said that there were installed in small works to-day, by up-to-date gas engineers, many of the appliances which witness had said were only used in large works.

Witness said there was a sprinkling of small works in which there were mechanical stokers, for instance, and agreed that there was a tendency to apply more and more labour-saving appliances in small works.

Counsel suggested that the reason why there were many small works which had not these appliances was that those works were out-of-date. Other plants which he suggested could utilize waste heat were the sulphate plant and water gas plant. He then asked whether witness knew of a single works of the size of the Horley Works where there was a surplus of waste heat beyond what was wanted for a waste-heat plant.

Witness said it was much better practice for a works of that size to go on supplying its steam from its present boiler plant, and to use the waste heat for the production of electricity. In this way they could use up the coke breeze and the fuel extracted from the furnace ashes for producing steam. It was better to make steam with that fuel than to try to sell it. If they were to shut-down the old boiler plant at Horley, and run the works with the steam generated by a waste-heat boiler, he did not think they would use it all. Asked what proportion there would be available, he said there would probably

be half of it. Waste-heat boilers, he said, were comparatively new. Asked if it would be fair to say that in the last five or six years it was proper gas engineering practice to adopt them wherever possible, he replied that it was so in the larger works, but not in smaller ones in all cases. If electricity were not generated by steam from waste heat at the Horley Works, he admitted that it might be a good thing to utilize waste heat for the works purposes.

COUNSEL then suggested that the water gas plant, if worked in this way, would require 50 p.ct. of the whole production of heat.

Witness said he had not worked this out. In re-examination, he stated that 900 lbs. of steam per hour could be generated from waste heat when the amount of coal carbonized was 18 tons per day.

MR. HUGH SEABROOK'S EVIDENCE.

Mr. *A. Hugh Seabrook* (Sir Charles Bright & Partners, Ltd., Electrical Engineers, and late General Manager and Chief Engineer to the St. Marylebone and West Ham electricity supply undertakings) gave evidence as to the electrical scheme, which had been prepared by Mr. F. A. Greene (Consulting Electrical Engineer), and which he himself approved. In the first instance, he said, he was retained, in conjunction with Mr. Gill, for the purpose of advising the Company solely on the question of the utilization of waste heat for the generation of electricity. The difficulty they were confronted with was that the recovery of gas-works "surplus" heat (this was a better term than "waste" heat) was comparatively new, and very few engineers had had the advantage of being associated with the work. There were a number of eminent engineers to-day who would more or less scoff at the suggestion that gas-works produced surplus heat which would be of any use whatever for the production of electrical energy. It had been referred to by some well-known men as a "stunt"; but he wanted the Committee to realize that it was very far from being a stunt. The experience of one gas company had induced them to extend largely the principle of surplus heat recovery. Two or three other works of the company were now being equipped with this plant, and their biggest works were putting-down a 2000-KW. plant; the whole of the steam used being produced by surplus-heat boilers. At present, the company in question were considering the cost of converting the surplus heat, and of disposing of it to outside users of electricity. One or two big undertakings had experimented, and were prepared to spend a considerable capital sum in proving the idea. The small undertakings, naturally, had not the financial resources, and had to wait for the results obtained by others. There was no question that the recovery of surplus heat had been carried out with marked success. At present it was being recovered chiefly from the carbonizing process, but it was being examined in other directions, and, in fact, a Continental engineering firm would now put down plant and guarantee the results, utilizing another form of surplus heat in gas-works—namely, the heat generated by coke quenching. Much valuable heat could be recovered from this additional source, which, so far as this country was concerned, had not even been touched. The firm mentioned was Messrs. Sulzer Bros., of Germany. Another important aspect of this question was that it worked towards the conservation of coal. One large gas company would be able to release about 100,000 tons of coke breeze per annum, which was now being used on their boilers. This 100,000 tons of coke breeze would be available, when the plant was completed, for use by other fuel-consuming companies. It was a simple matter to deduce roughly the result if this heat recovery were applied to every gas undertaking throughout the country. Coming to the Horley Gas Company's electricity scheme, witness handed in a table giving the estimated results of the first two financial years' working. It had been decided to instal alternating current at 240 volts, single phase. In a place such as Horley, single phase would be cheaper and better than three-phase, the latter being more suitable where there was a demand for power. In Horley the proposition was a thin one for the first few years, but it was hoped that it would develop. In the first year he estimated that the units generated would be 70,000, and the units sold, 53,000; losses in transmission accounting for the difference. The maximum demand expected was 50 KW., the load factor 12 p.ct., and the number of consumers 150. The Gas Company, having been in the neighbourhood for 30 or 40 years, were more likely to get consumers than were a new concern, because they had local influence and valuable knowledge. The gross income from current and meter rents was estimated at £1965, and the average price obtained per unit 8·6d. (10d. for lighting and 3d. for power). The expenditure, for generation, depreciation, rents, rates, and taxes, management and administration, was estimated at £1433, or 6·50d. per unit. During the first year, three-quarters of the units supplied could be produced from an engine run by the surplus heat plant, and the remaining quarter by an internal combustion engine, gas or oil driven. Thus the fuel costs to the Company would be reduced by three-quarters, whereas a separate company would have to use fuel to generate the whole. The cost of actual generation was £373 for the 70,000 units, £300 of that representing cost of wages, repairs, and maintenance, and the £73 representing the cost of the fuel to generate one-quarter of the output (17,500 units), at 1d. per unit. The net profit for the year was estimated at £532. In the second year he estimated 110,000 units generated, and 87,000 sold; the maximum demand being 75 KW., the load factor 13·5 p.ct., and the number of consumers 200. This represented a normal increase. Only two-thirds of the units generated would be produced by waste heat, and one-third would be produced by fuel. The income was estimated at £2820 for current and meter rents; the average price obtained for current being 7·5d. per unit. As to generation, the wages, maintenance, and repairs would amount to £400, and the cost of fuel for one-third of the output, £152, making £552. The total expenditure would be £1852, equal to 5·13d. per unit; leaving a net profit of £968. It had been found, said witness, that where gas and electricity supplies were combined, the gas consumption increased rather more rapidly than previously, though there was apparently no competition. It was difficult to explain why, but it was a fact. He had assumed that in the second year of the electricity supply the amount of waste heat available from the gas-works would be the same as in the first year, but if the consumption of gas increased, the amount of waste heat would increase, and the Company would be able to generate more than two-thirds of the output of electricity by the utilization of this heat. As to capital expenditure, the amount on generating plant in the first year, including surplus-heat recovery plant, would be £4770, and the expenditure on mains £8813, making a total of £13,583. In the second year the capital expenditure would have reached £6270 on plant, and £10,000 on mains, making £16,270. With regard to the suggestion that the Gas Company sought electricity powers in order to prevent competition with the gas undertaking, he said this had not been substantiated. He had been associated with two gas companies who had promoted electricity Bills. These Bills received Royal Assent in August, 1923, and in both cases the generating stations were opened by August, 1924. There was no object in spending a lot of money and letting it lie idle. He looked at the matter purely from the commercial point of view, and was not prejudiced.

Mr. TYLDESLEY JONES, cross-examining, referred to a paper read by Mr. Seabrook before the London and Southern Junior Gas Association on this subject, on Jan. 27, 1922 (see "JOURNAL" for Feb. 1, 1922, p. 259), in which he had said "My proposal to combine gas and electricity stations can easily be damned by the engineer, gas or electrical, who does not like the idea." Counsel suggested there had been a good deal of damnation of the idea, and witness agreed. In the reply to the discussion, witness had said that Mr. S. B. Chandler (of the South Suburban Gas Company) had touched on the weakest spot in the whole thing—that was the danger of what the Americans called "combination in restraint of trade." Thus even the witness had to admit that, delightful as was the idea from the point of view of the engineer, there was a weakness in that combination possibly in restraint of trade.

Having ascertained from witness that the only power uses which he had in mind at Horley when arriving at his estimates were domestic, Counsel asked if there were any laundries in the district, and suggested that they were good customers for electric power. Witness replied that he believed he had seen one laundry, but considered 3d. per unit too high to be attractive in that case. Counsel thereupon suggested that the Company might cut the price for power very fine, in order to secure a power load, and then secure the lighting of the laundry; but witness regarded that as an unbusinesslike proceeding. Counsel pointed out that witness had taken charge of the St. Marylebone Borough Council's electricity supply undertaking at a time when it was saddled with a big debt, but had built-up the business and made it a paying concern, and had had to cut prices very fine for some years in order to do this. Witness agreed, but said that one must take into account the difference in the kind of residents in St. Marylebone and Horley. He agreed that it was his experience that in districts such as Horley, where many houses had their own electric generating plant, those plants were shut-down as soon as a public supply of electricity became available.

With regard to the estimated cost of generation, Counsel pointed out that, though it was intended to take away from the gas undertaking for the purposes of the electricity undertaking the waste heat which, if used in the gas-works, would reduce the cost of making gas, nothing had been allowed the gas undertaking in this respect. Witness replied that the gas undertaking would not be really any worse off by the utilization of the heat, which was at present waste. There was a good deal of rubbish in the way of fuel generally used in gas-works boilers for the production of the small amount of steam required; and in a case such as the Horley undertaking that fuel could not be disposed of otherwise. The average small gas company found that the steam raised by the use of this waste fuel was sufficient for their purposes, and they did not recover surplus heat, because, until they were able to supply electricity, they had no use for it. No one in his senses would instal mechanical conveyors and machinery of that type in a works of this size.

Discussing stand-by plant, Counsel asked what happened if the 50 KW. alternator to be installed broke down. Witness replied that if it broke down outside the winter months it would not have any effect on the supply, but if it broke down completely in the winter months he would have to replace it, and the demand could not be met in the meantime. He had allowed for all the plant usually installed in a small undertaking, where they could not afford to duplicate expensive plant. Counsel asked if it were not an absolute axiom of all electrical engineers that they must have, as spare plant, a unit of the size of the largest unit. Witness did not agree in the case of small stations, but in important stations it was so. In small stations they had to run certain risks. Counsel retorted that that was not very cheery for his clients, who were residents of Horley.

With regard to capital expenditure, Counsel ascertained that, though part of the gas-works site would be used for the erection of the generating station, no allowance had been debited to the electricity undertaking in respect of this. Witness did not see anything wrong in this, and, when asked whether the gas undertaking could not sell that land if it did not intend to use it for gas-works purposes, he said that it was of no value in the middle of a gas-works site, and could not be sold. Counsel said that, when the generating station was being erected, the coke store would be farther from the gas-works, and the cost of transporting it would be greater for the gas undertaking; but witness thought that this would make no appreciable difference. Counsel, examining a plan which he had not seen before, said the site was overcrowded, and that there was not sufficient space even now to devote to the development of the gas-works. Witness differed. The site comprised two acres.

Finally, Counsel pointed out that nothing had been allowed in the estimates put in for the costs of the present Bill, and wondered whether that was to be debited to the gas undertaking.

Re-examined, witness said that if an undertaking were overloaded financially by the installation of spare plant to ensure against every possible accident, it was not business. The combination of electricity undertakings with existing gas undertakings was the only way in which to get electricity into districts with a small population, and, at the same time, to produce reasonable remuneration on the capital. There were a number of small electricity companies which had never paid a dividend, and were not likely to, and it was not sound to put money into a business if it were not going to earn money.

Major *D. Napier-Whittingham* (Acting Managing Director of the Sussex Electricity Supply Company, Ltd.) gave evidence to the effect that his Company were desirous of obtaining a bulk supply of elec-

tricity from the Horley Gas Company, because, if it were not obtainable, they would themselves have to expend considerable capital on new plant.

Cross-examined by Mr. Tyldesley Jones, who suggested that it would not matter whether the bulk supply came from the Gas Company or from the Horley Electricity Company, witness said he would prefer it from a long-established Company which he knew to be sound financially. He did not reply when asked whether he would like it from an undertaking which would have to shut-down if an engine broke down.

Monday, March 23.

Mr. *H. J. Randall* (a Director of the Horley District Gas Company, and Engineer and Manager of the Yorktown and Blackwater Gas and Electricity Company) in evidence said that in the autumn of 1922 the Directors of the Horley Gas Company were considering the question of getting electricity powers, and in November of that year had written to the Gas Companies' Protection Association for advice. The Secretary of the Association had advised them that the two courses open to them were to promote a late Bill in Parliament in the 1923 session, or for the Directors to promote a Special Order under the Electric Lighting Acts, with a view ultimately to transferring the powers to the Company when they got the necessary sanction from Parliament. They had at first decided to adopt the second course, but, on the advice of their solicitors, had ultimately deferred action, owing to the possibility of the passage of the Bill introduced by Mr. R. G. Clarry, M.P., to give statutory gas companies facilities for obtaining electric supply Orders from the Electricity Commissioners, instead of having to go to Parliament for power. He corroborated the statement made by Sir Harry Courthope-Munroe with regard to the events leading up to the promotion of the present Bill. He considered that a gas company, under ordinary conditions, should be able to distribute electricity in an economic way, and pointed to the economies arising from the combination of the two undertakings. This was particularly the case in such a district as Horley, where the greater part of the load was for lighting, and was almost negligible in the summer. The idea of using waste-heat plant for generating electricity was that, through the hours of the night, after the load had dropped, and also during the day when there was not a large demand, the waste-heat plant could be used, and when the demand increased, the auxiliary gas or oil driven plant would be used. Dealing with the experience of the Yorktown and Blackwater Gas and Electricity Company, he said that the demand for electricity had increased steadily since 1921, and the gas load had also increased. His figures showed that in 1922 the Company had sold 23,701 units, and in 1924, 75,970. In 1922 and 1923 they had cleared costs, and in 1924 had made a profit of 5 p.ct., after allowing for 5 p.ct. depreciation. In 1921 the output of gas was 132 million c.ft., and at the end of 1924 it had increased to 159 millions.

Statistics were then given as to the progress of the gas undertaking at Horley between 1913 and 1924. The mileage of mains had increased by 31·6 p.ct.; the number of consumers by 49·7 p.ct.; the sale of gas by 76·6 p.ct.; the prepayment meters in use by 61·3 p.ct.; the ordinary meters by 30·8 p.ct.; stoves by 168·4 p.ct. The gas sold in 1913 was 38,705,300 c.ft., and in 1924, 68,363,100 c.ft. The price of gas in 1913 was 4s. per 1000 c.ft., and the average price in 1924 was equivalent to 5s. 8½d.

As to the suggestion made by the Electricity Company at Horley that stoking machinery might be installed at the Horley gas-works, witness said that at Horley there were gaseous-fired horizontal retort settings on the regenerative principle, single-ended. It would not be economical to instal machinery for dealing with the number of retorts in use there, nor would it be economical to instal plant to utilize waste heat for the purposes of the works, because steam was generated at present by breeze, for which no market was available. Even if there were no waste heat available at Horley, he would still advocate the generation and supply of electricity there by the Gas Company.

Mr. TYLDESLEY JONES, cross-examining, said that the people of Horley had been agitating for a supply of electricity for years, but no effort had been made by the Gas Company to give it.

Witness would not agree that the supply had been needed for years.

COUNSEL suggested that in October, 1922, when the Gas Company had first decided to seek powers to supply electricity, there was a local agitation for a supply, and that it was because of this that the Company had decided to seek powers.

Witness denied this. He maintained that the question had been under consideration by the Gas Company before that time.

In the course of further discussion, Counsel examined the minute book of the Company, to show that there was no minute indicating that the matter had been discussed prior to the holding of a meeting of local residents with a view to forming an electricity supply company. He also referred to the letter from the Secretary of the Gas Companies' Protection Association to the Horley Company, in order to substantiate this. Counsel went on to explain that the first scheme prepared on behalf of the residents was rejected by them, and negotiations were opened with another firm, in London, with regard to preparing another scheme. In February, 1923, a notice had been published by the Gas Company in a local paper to the effect that application had been made by them for power to supply electricity, and he obtained the admission from witness that this was not correct, because application had not been made. Counsel also pointed out that nothing had been done by the Gas Company from February, 1923, until June, 1924, when they had resolved to apply for powers, but at that time another public meeting was held at Horley, at which it was decided to form a company to supply electricity. His suggestion was that the Gas Company would have done nothing but for the action of the local residents. He also said that in September, 1924, a letter was sent to the Secretary of the new Company informing him of the steps taken by the Gas Company, while a similar letter was also sent to the local Press, with a view, he suggested, to preventing the continuance of the new Company. Witness replied that the letter was written to the Secretary of the Company simply for the purpose of making him acquainted with what was going on. The prospectus of the new Company was out by that time, and Counsel suggested that the letter to the local Press was an attempt to stop people from subscribing. Notwithstanding this, over £10,000 had been subscribed by local people. Witness did not know whether those subscribers were local people.

Reference was then made to the development of the gas undertaking, and Counsel referred to a number of areas in which the Company had had powers to supply since 1886, but had not yet given a supply. In these areas there were important clusters of houses which ought to be supplied. Witness said that these areas were situated at some distance from the works, and were rural in character, and that to supply them was not a commercial proposition at the moment.

Replying to further questions, witness said that the Horley Gas Company had approached the London and Brighton Section of the Southern Railway with regard to obtaining a bulk supply of electricity, and the Railway Company had replied that they were prepared to consider it if the Brighton line were electrified. Electrification, however, was too far off.

With regard to the prices charged for gas at Horley from 1913 onwards, Counsel ascertained from witness that the candlepower of the gas supplied in 1913 was 15¾, which was equivalent to more than 600 B.Th.U. per c.ft. In 1924 the prescribed calorific value was 475 B.Th.U. per c.ft., so that, in order to get the same heating power in 1924 as in 1913, a larger volume of gas had to be used. Thus, said Counsel, if the calorific value of the gas supplied to-day were the same as in 1913, the price per thousand c.ft. would be 7s. 2d. instead of 5s. 8d., and the former figure had to be compared with the pre-war figure of 4s.

With regard to the statement made at the beginning of the proceedings, that 21 gas companies had been granted electricity supply powers, he said that, of those, six had had their powers revoked; two had transferred their electricity powers to other bodies; one had transferred its gas powers to another body; and in one case no supply was given at all. Thus, in twelve cases a supply was being given, and in one of these the Company had no gas powers, so that there were only eleven companies supplying both gas and electricity.

With regard to statements made previously, to the effect that coke breeze was used at the Horley Gas-Works to generate steam, and that there was no market for it if it were not so used, Counsel exhibited the accounts of the Company for the last three half-years, which showed the amount of breeze used at the works and the amount sold, there being none in store at the end of each half-year. This indicated, he said, that there was a local market for breeze.

In re-examination, witness said that he had introduced the question of supplying electricity when he had joined the Company in 1922, and at that time he knew nothing of the attempts made by other people in the district to form a company.

Mr. *Alexander Horn* (member of the Reigate Rural District Council) said he was of opinion that Horley would get a supply of electricity more quickly if it were in the hands of the Gas Company than if it were in the hands of the new Electricity Company. It was also more convenient to the consumers to deal with one Company for the supply of the two commodities than to have two separate companies. It was not correct to say that the Rural District Council were supporting the new Company. The attitude of the Council was to take neither one side nor the other. When a resolution was moved in regard to the Electricity Company's application for powers, the mover had said that he did not ask so much for the consent of the Council, but simply that the Council would raise no objection.

Mr. TYLDESLEY JONES said he had been told by an official of the Ministry of Health that the Ministry had a formal resolution, sealed by the Rural District Council, giving their consent.

This concluded the case for the promoters.

Mr. TYLDESLEY JONES, addressing the Committee on behalf of the Electricity Company, said that that Company was formed by local residents for the purpose of supplying electricity in their town, and the fate of the present Bill was of great importance to them. They had subscribed over £10,000, and were prepared to spend more for the purpose of inaugurating a supply, and had had an expensive Parliamentary fight thrust upon them by the action of the Gas Company. Horley should have had a supply long ago; it was bigger than the adjoining district of Crawley, which had had a supply since 1908. The Gas Company had had its hand on this area since 1886, and, with the exception of a very small part, had not supplied gas within it. With regard to the events leading up to the promotion of the Bill, he said the facts were that the Gas Company first decided to ask for electrical powers after the local agitation in 1922, and that the Gas Company had acted in order to defeat this agitation. The first scheme prepared at the instance of the local residents was turned-down in February, 1923. It was in that month that the Gas Company had published a notice in the local paper to the effect that application had been made by them for powers; but this statement was untrue. From that time until June, 1924, the Gas Company did nothing. Then another public meeting was held by the residents. Thus, their first movement, in 1922, synchronized with the local agitation, and the second move, in June, 1924, synchronized with the next public meeting. In the meantime, those local residents concerned with the previous scheme had been negotiating with a London firm with regard to a more suitable scheme; and the negotiations had occupied them up to June, 1924. While the matter was being conducted privately, and the Gas Company knew nothing about it, the latter were quiescent; but when canvassing began, and the matter became known, they wakened up again. It had been said that the Gas Company had delayed, owing to the presentation of a Bill to Parliament to give statutory gas undertakings means of obtaining Orders from the Electricity Commissioners. This Bill, however, was not introduced until May, 1924, and did not explain the delay in 1923. It was thought that one of the best ways to kill the Electricity Company's scheme was to deprive it of money by warning the public not to subscribe, but, notwithstanding the information that the Gas Company proposed to promote a Bill, the public put down the money. If the minimum amount had not been subscribed, he doubted whether the present Bill would have been promoted. An engineer from the Electricity Commissioners had visited the locality and had held an inquiry. A site had been secured adjoining the railway, and objection had been raised with regard to the site; but whoever had engineered that opposition had failed, and the Commissioners had granted an

Order. The initiative in this case was with the Electricity Company. With regard to the question of competition between gas and electricity, he said there ought to be healthy competition; there was no question that the consumers benefited thereby, and it was due to the electrical competition that the gas industry had made the strides it had. It was all the more necessary in small areas such as Horley, where gas companies were apt to be a little slack, unless they had a rival to keep them up to the mark. The expedients that had been used by Mr. Seabrook at St. Marylebone, in order to develop the electricity undertaking there, would not be used by a Company who, if they obtained the electricity load, lost the gas load. There could not be competition between gas and electricity where they were supplied by the one concern.

The Committee then adjourned.

POOLE HARBOUR BILL.

This Bill, which was before a Committee of the House of Lords presided over by the Marquess of Bath, K.G., C.B., on March 23 and 24, was opposed, among other petitioners, by the Bournemouth Gas and Water Company. The main point of the Gas Company's opposition was that they desired power to nominate a representative on the Harbour Board.

Mr. Rowand Harker and Mr. H. F. Bidder appeared for the promoters, and Mr. Arthur Moon for the Gas Company.

Mr. Rowand Harker, opening the Bill, said that its objects were to obtain power to increase the maximum rates of dues and charges by 100 p.ct., to obtain powers as to the remission of certain parts of the boomage rates on vessels of certain classes, as to rebates on boomage rates, and as to qualification for membership on the Board of the Commissioners. The Gas Company did not object to the increase of maximum rates by 100 p.ct., but asked that they should be subject from time to time to revision by the Minister of Transport. They objected to the provision with regard to rebates on boomage rates, and asked for the statutory right to nominate one member on the Board, so that the number of Commissioners would be increased from 18 to 19. The Harbour Commissioners regarded the suggestion as a matter of principle of some importance. The Gas Company apparently claimed that right because at the present time they were the body who paid the largest sums in dues and rates, which statement was perfectly accurate. But it might well be that the time would come when some other body or company would be paying as much or even more than the Gas Company. As a matter of fact, the General Manager of the Company was at present on the Board, and any particular matter which the Gas Company might wish to urge before the Board could be urged by him. But, on principle, the Commissioners asked the Committee not to say that any company, whether statutory or otherwise, should be entitled to nominate a member. It might be suggested that there was a precedent for doing this in the fact that the Southern Railway Company had the right to nominate a member; but the distinction between a railway company and a gas company was, in his submission, obvious. The Southern Railway Company were vitally interested in the welfare of the port from many points of view; and this, no doubt, was the reason which had influenced the Board of Trade in giving them representation.

With regard to the revision of prices, it was suggested by the Minister of Transport that he should have power to revise the maximum charges, whereas at present the Board of Trade had power to revise the actual charges.

Mr. *William Cash* (Chairman of the Bournemouth Gas and Water Company), in evidence, said that the Company were in no sense antagonistic to the Harbour Commissioners, and realized that the interests of the Company and of the Harbour Commissioners were identical. He supported the proposed increase of rates by 100 p.ct., though the Gas Company paid, in fact, about 40 p.ct. of the total income. It was felt that the Commissioners were well advised in making expenditure on the harbour; and if it were necessary to raise the rates, he had no objection. Owing to the large proportion of the rates and dues the Company paid, it was not unreasonable that they should be allowed to nominate a member of the Commission. The Company had a very large interest in the port, and had always worked harmoniously with the Commissioners, but their interests did not always coincide with those of other traders, and, therefore, they would like a representative. It was true that the traders had elected the General Manager of the Company as a Commissioner, but this was only on votes, and the voting lay in comparatively few hands. The Company had only a limited number of votes.

Mr. Arthur Moon, addressing the Committee, said that the position was that the Company, though they supported the application for an increase of rates, considered it ought to be made a condition of allowing the increase that they who chiefly paid that increase should have a representative on the Board. It was the only way to ensure fairness, because otherwise they depended upon the good wishes of the other electors. It was obvious that the time might come when the other persons who had a vote would have different interests from those of the Gas Company. At present the private wharves had 35 votes, and they paid £1400 in dues; the Gas Company had 6 votes, and paid £2500 in dues; other traders had 70 votes, and paid £2100.

There was some discussion as to whether the Committee had the right to alter the constitution of the Harbour Commission. If it were wrong for the Committee to give the Gas Company representation on technical grounds, said Mr. Moon, then the Harbour Board could never be altered unless the harbour authorities wanted to alter it. This would be a farcical result, and he did not think there could be any question that the Committee had absolute power to alter the constitution. From the point of view of voting alone, it seemed that it was not only fair to the Company, but desirable in the interests of the harbour, that the Company should have a permanent representative on the Board. But, in the case of a public utility Company, who were there partly for the benefit of the public, and a Company who had spent money on the public works of the harbour, and a large sum on providing private appliances for loading and unloading their coal, they should be all the more entitled to representation. He was willing, if the Committee considered it fair, that this right should only continue so long as the Company paid a certain proportion of the dues, the proportion to be fixed by the Committee; but he submitted that this limitation was unnecessary. He also said that the Bill would be a better one if the clause giving the Minister of Transport power to revise maximum charges were inserted.

Mr. Rowand Harker contended that if the Committee gave representation to the Gas Company, he did not see how, in principle, it could possibly be resisted in the case of any other undertaker who paid substantial sums. But there was also the question as to whether it was possible to alter the constitution without placing the whole Bill in jeopardy, on technical grounds. Apart from this, the promoters might be met in the other House by petitioners objecting to the alteration.

The Committee decided to allow the Bill to proceed, subject to the inclusion of the revision clause suggested by the Minister of Transport.

THE ELECTRICAL INDUSTRY AND THE SLIDING-SCALE.

The various electricity Bills which embody the agreement with the London County Council for the postponement of the purchase rights of the Council from 1931 to 1971 are now receiving the attention of a Select Committee of the House of Commons presided over by Sir Arthur Shirley Benn. These Bills, it may be recalled, have been suspended since last summer owing to obstructive tactics in the House during the latter part of last session, when the Labour Government was in power; but they have been carried over until this session, having already passed through the House of Lords. At the beginning of this session there were four Bills; but one of them, the County of London Electric Supply Company's Bill, which proposed to take in practically the whole of Essex as a power area, has fallen by the way, having been rejected by the present Government on second reading. There thus remain three measures which have an important bearing upon the scheme for co-ordinating electric supply in the London and greater London area by the Electricity Commissioners. One of them is promoted by what has come to be known as the Ten West-End Companies, and the other is promoted by the remaining four companies which deal with the City and adjacent areas. Both these measures embody an agreement with the London County Council for the postponement of its purchase powers until 1971, at which time the undertakings will be handed over to a Joint Electricity Authority, yet to be constituted, free of charge. The third Bill is by the North Metropolitan Electric Power Company, which also has some bearing—though not such an important one as the other two Bills—on the scheme for supply in the London and greater London area.

With the general details of these schemes we are, of course, not specially concerned; but one point has arisen during the course of their consideration which is of a little interest—namely, the application of the sliding-scale to the electric supply companies in London under the agreement with the London County Council with the acquiescence of the Electricity Commissioners. Here again we are not concerned so much with details as with the principle, and even so only by reason of the fact that the gas industry has been "prayed in aid," an expression lawyers are rather fond of in bringing the matter to the notice of the Committee. The particular form of sliding-scale proposed is one in which the companies are given a minimum dividend and a standard price, so that the slide only operates in one way—namely, in the upward direction. In other words, the company can increase its standard dividend by reductions in price to the consumer, but if at any time it is necessary to increase the price to the consumer, the dividend never falls below a fixed minimum. This is the same principle as has been applied to several gas undertakings since the war, with the object of making it easier for them to raise capital.

During the course of the proceedings on the first of the series of Bills now under consideration, the City of London Corporation have strongly opposed; and their Counsel, Sir Lynden Macassey, K.C., has endeavoured to stress the point that the bargain in this respect is not in the public interest. He made considerable play with the fact that last year, in connection with the Rhymney Gas Bill, evidence was given by Mr. Honey, of the Board of Trade, to the effect that the Board do not now favour the sliding-scale which operates only in the upward direction.

The Chairman of the Committee at one stage interpolated the remark that the position in the gas industry would not influence the opinions of the Committee in connection with these Bills, as the circumstances were so totally different.

Sir Lynden Macassey, however, pressed the point, and contended that Parliament have for all practical purposes abandoned the new form of sliding-scale, and that to ask the Committee to impose this same form of sliding-scale upon the electrical industry—and moreover, the first time that a sliding-scale had been applied to this industry—required very serious consideration, and he would not be doing his duty to his clients if he did not bring the facts before the notice of the Committee.

Later on in the proceedings, Mr. William Cash, who has advised the London County Council in this matter, argued that, in the special circumstances of the London electricity supply problem, he considered that the financial scheme in the agreement with the London County Council, which involves the new form of sliding-scale, is fair and justifiable. Incidentally he mentioned that he would prefer the old sliding-scale, at any rate for large concerns, because, though the ordinary sliding-scale did militate against the issue of new capital by small undertakings, he was not at all sure that the new form was an advantage when it came to big capital issues. He pointed out to the Committee, however, that, in the case of the Rhymney Gas Bill, the Chairman of the Committee which considered it, after hearing Mr. Honey's evidence, gave the decision that he did not rule out the principle of the new sliding-scale, but that the Committee did not think it wise to apply it in the particular circumstances of the Rhymney Company.

LEGAL INTELLIGENCE.

DAMAGES FOR BREACH OF CONTRACT.

On Monday, the 23rd ult., the case of the *Dursley Gas Light and Coke Company, Ltd., v. Low-Temperature Carbonization, Ltd.*, came before Mr. Justice GREER in the King's Bench Division.

Mr. E. A. DIGBY, who appeared for the plaintiffs, said they had received a letter from the defendants' solicitors, dated March 20, stating that the case would not be defended. The action was brought to recover £7 10s. a day from Jan. 1, or a total of £357 10s. The claim arose in this way: On Jan. 16, 1924, the plaintiffs entered into a contract with the defendants by which the former were to lease to the latter a piece of land on which the defendants were to erect a number of retorts. The gas was to be supplied within three months of the lease being granted. The retorts ought to have been erected some time ago, but nothing had been done up to the present. The plaintiffs had suffered considerable loss through the default, as they had entered into other contracts on the faith of the defendants carrying out theirs.

Dr. *Adams*, the Chairman of the Gas Company, said he had personal knowledge of all the transactions with the defendants. Nothing had been done by the defendants under the contract, and in consequence his Company were suffering severe loss.

His LORDSHIP entered judgment for the plaintiffs for £357 10s., with costs.

AN OXYGEN DISPUTE.

On Wednesday, March 25, the case of the *British Oxygen Company, Ltd., v. Liquid Air, Ltd.*, came before Mr. JUSTICE ROMER upon motion for an injunction to restrain defendants until trial or further order from publishing, printing, or circulating a letter of Dec. 17, 1924, addressed by the plaintiffs' Lancashire district agent to Tanks & Drums, Ltd., of Bradford, in which he set out the terms on which the plaintiffs were willing to supply oxygen to that Company, and from allowing the letter to be photographed, or copies and extracts made for the purpose of informing the public of its contents.

Mr. UPJOHN, K.C., said the plaintiff Company was formed in 1886 to make and supply oxygen, and to make oxygen plant. Defendant Company was formed in 1913; the business being the manufacture of oxygen gas plant. Plaintiffs were in a large way of business, and had installations throughout the country, from which oxygen was supplied in cylinders. Among other customers were Tanks & Drums, Ltd. The defendant Company were minded to become their rivals in the sale of gas plant, so that purchasers could make their own oxygen. Among other firms, they approached Tanks & Drums, Ltd., who were old, and large, customers of the plaintiff Company; and the latter, not wishing to lose their business, instructed their Lancashire district manager to write offering a low quotation for oxygen, on condition that they took a certain quantity, and did not set up any plant to supply. The defendant Company's Manager heard of this letter, and having obtained a copy from the Manager of Tanks & Drums, Ltd., had it photographed. Copies were then forwarded to brokers and jobbers on the Stock Exchange, with a request that it should be shown to others who were interested in dealings in the shares of the plaintiff Company. The result was a fall in the price of the shares. The price quoted to Tanks & Drums, Ltd., was a special one, at which they could not offer to supply small customers; but the quotation had been used to convey the impression that the effect of the defendants' competition was such that the plaintiff Company had to reduce their price to one at which they could not possibly make a profit.

Sir H. SLESSER, K.C., for defendants, denied that photographs of the letter had been shown on the Stock Exchange.

Mr. UPJOHN, in answer to his Lordship, said he rested his case on copyright, and, next, that there had been a breach of confidence.

Sir H. SLESSER submitted that the question at issue could not be properly tried on motion, but should be dealt with at the trial. For a long time the plaintiffs had tried to interfere with the defendants' business, so as to prevent their raising further capital and getting a quotation on the Stock Exchange. He contended that defendants were entitled to use the letter, to protect their own interests. The motion was, in his view, an abuse of the process of the copyright law.

After hearing the affidavits filed on both sides, the hearing was adjourned till the following day.

On Thursday,

Mr. UPJOHN contended that the copyright of the letter being the plaintiffs', the defendants were clearly in the wrong in multiplying copies by means of photography.

Sir H. SLESSER contended that the letter in question was not a literary work in any sense, but merely a commercial document in which there was no copyright within the meaning of the Act of 1911. But, assuming the letter was a literary work within the meaning of section 1, the defendants had only used it—as they were entitled to do—for the purpose of criticism, and to show how the plaintiffs were trying to injure the defendants' business. All they had done was to protect their own interests. The Court having a discretion in this class of case, he asked his Lordship to hold that, having regard to all the circumstances, the letter was not one which ought to have the protection of the law of copyright.

His Lordship reserved judgment.

Auckland (N.Z.) Gas Company, Ltd.—The profits for the year's working amount to £79,036, making, with the balance of £34,519, £113,555. The Directors recommend a dividend for the past half-year at the rate of 8 p.ct. per annum on the £1 fully-paid shares, and proportionate amount on the contributing shares, 4s. paid. This will leave £37,457 to be carried forward.

MISCELLANEOUS NEWS.

JUBILEE OF THE MUNICIPAL GAS-WORKS AT THE HAGUE.

The following interesting particulars are extracted from an attractive brochure for which we are indebted to the courtesy of the Manager of the Hague Gas-Works, Mr. J. E. H. Bakhuis:

In 1844, when the competition of "portable" gas, supplied in iron casks, was still a thing to be feared, a concession for the supply of gas at the Hague through mains was granted to Mr. Neville Davison Goldsmid, who erected a plant in the Lijnbaan. The price originally charged was 24½ c. per cub.m., equivalent to about 11s. 6d. per 1000 c.ft. In 1875, this works was purchased by the Municipality for £43,000; but as the plant proved to be inadequate for the growing consumption, it was decided to build a new station in the Loosduinschen weg. The opening of this works in 1876 was followed, in 1879, by the shutting-down of the Lijnbaan Works, where the cost of production was considerably higher than at the more modern station. By 1886 the price of gas had been reduced to 7 c. per cub.m., equivalent to 3s. 3d. per 1000 c.ft.

Mr. J. E. H. Bakhuis, the present Chief Engineer, succeeded Mr. Kros as Manager in 1896. In 1905 the works in the Loosduinschen weg began to approach its maximum output of 150,000 cub.m. (approximately 5,300,000 c.ft.) per diem; and the Municipal Authorities—true to their policy of reducing the cost of production—therefore decided to construct yet another new works on the Trekvliet canal, which gives 500-ton barges direct access. The present daily output of this works (opened in 1907) averages 150,000 cub.m., the length of mains being 428 km., or about 265 miles, and the number of consumers 85,000. It is interesting to note that the leakage, which in 1875 amounted to 26·7 p.ct., is now only 2·67 p.ct., or exactly one-tenth of what it was fifty years ago.

The old works in the Loosduinschen weg was closed in 1924.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Meeting.

The Half-Yearly Meeting of the Company was held on March 25—Mr. F. J. DICKENS presiding.

The CHAIRMAN, in moving the adoption of the report and accounts, said that two of the most satisfactory features in the accounts were: A further increase of 5½ p.ct. in output, and the marked diminution in the quantity of unaccounted-for gas. The sales of gas in Dublin to-day were more than 60 p.ct. greater than they were immediately before the introduction of electricity. In the circumstances, it is strange to find there were still people who thought the days of gas were numbered. During the year they had secured 2212 new consumers, and 2778 new cooking and 860 further heating stoves had been sent out. The expenditure on manufacture of gas was approximately the same as the corresponding period—the actual figures being £150,157 in 1923, and £152,358 in 1924. As to the income obtained from residual products, the results were decidedly better than in 1923, as there had been an increase of no less than £15,436. The future outlook for the residual market, however, was not so good.

The total cost of distribution of gas was larger by nearly £4000. Most of the increase was due to the special examination of consumers' service pipes, which, as he had explained on a previous occasion, was being carried on with the object of giving, where possible, a more efficient supply, and, at the same time, tracing any leakage which might exist, so as to cut down to a minimum the loss under this head. In the repairs of meters account, there was an increase of something over £1700, by reason of the fact that a substantially larger number were repaired.

To sum up, expenditure for the half-year was down to the extent of £1347, while income was up by £1586, and thus they were enabled to carry into net revenue a profit larger by £2933. The balance of net revenue available, £60,068, would permit of a somewhat larger dividend being paid than that recommended, but the Directors felt convinced that 6¼ p.ct. should not be exceeded. As the reserve fund still required to be strengthened, and this could only be done out of divisible profits, an appropriation was recommended of £8275, which would bring it up to the round figure of £75,000, and the balance of £3296 would remain to be carried forward to the next account. The balance-sheet again disclosed a satisfactory state of affairs. The funds showed an increase of over £27,000, while liabilities to tradesmen and others had only slightly advanced. Stocks were heavier, and debtors had fallen by approximately the same amount. The value of investments was larger by £12,000.

Mr. AUGUSTINE BIRD seconded the motion, which was passed.

The CHAIRMAN moved, and Mr. W. H. DAVIES seconded, the declaration of a dividend at 6¼ p.ct., less tax, on the consolidated ordinary stock of the Company. This was agreed to.

The Yorktown and Blackwater Gas Company.—The Company are holding two exhibitions this week. A complete and comprehensive display of "Richmond" cooking, heating, and water heating apparatus (which includes a series of their popular "Bungalow" cookers) has been tastefully arranged in the Woodclyffe Hall, Wargrave, and also (for the latter half of the week) at the Assembly Rooms, Twyford. Both of these new districts promise rapid development; and the Gas Company are to be congratulated on their initiative in running the necessary mains and in organizing these exhibitions to popularize the use of gas. An interesting series of cookery lectures and demonstrations is attracting a gratifying attendance; and special baking competitions for adults and children have aroused considerable interest in both districts.

RADIATION LIMITED.

At the Annual Meeting of the Company, held at the Queen's Hotel, Birmingham, on March 24, the Chairman, Mr. H James Yates, in moving the adoption of the report and accounts, said:

Radiation Policy.

It may perhaps be in the memory of some now present that when I first addressed you as Chairman of Radiation I outlined the policy which we proposed to follow. As I then stated, the object of bringing together the principal gas stove manufacturers of this country was to stop the waste occasioned by their vying with each other in useless expenditure; to "pool" the knowledge and capacity of the various companies; to concentrate more than ever on research work; to embody the results of that work in the types of apparatus we made; and, as far as possible, to standardize these types, so that all the component parts should be interchangeable—a matter which means so much to our largest customers, the gas undertakings, who maintain these stoves and stock the parts necessary for this purpose. The firms comprised in Radiation had always been in the van of progress; but it was felt that, by the uniting of their efforts, a much higher standard could be set—that we could produce better goods, increase the output, and give greater value for money. This policy we have ever since steadfastly pursued. High as the standard is which we set for our goods, and which we have attained, we are aiming to reach one still higher. The first cost of an apparatus to the purchaser is not necessarily the only consideration; but the higher the quality of that apparatus, the greater the satisfaction it gives to the user, and in the long run the less expense is required for keeping it in condition. It was our intention—and we have succeeded in translating that intention into accomplished fact—to make the "hallmark" of Radiation upon any gas apparatus a guarantee that it is of the best quality attainable, and that it will give the longest service with the highest efficiency. We have also created the position that people who purchase Radiation apparatus appreciate that our services and advice are always available to anyone who requires them. To produce goods on such lines, and create such a position, naturally adds to cost; but though, consequently, our prices may not always be the lowest in cash amount, they actually are the lowest when their durability and also their economy in gas consumption are taken into account.

A Successful Year.

Our year's trading has been a successful one; but, like all other manufacturing concerns, we have had many difficulties to overcome. Our business has greatly increased, and as a result we have had to make extensions to our various works.

Our costs of production in some sections have risen; while in the case of others we have derived some benefit from our introduction of still further improvements which have reduced cost. Our object is continually to expand our business, and, as our costs come down, to give a full share of the benefit to our customers. The larger a business is, the less it "feels the draught" when times are bad; and for this reason it is far better to have a big turnover with a smaller margin of profit than a smaller turnover with a big margin of profit.

The Burden of Taxation

I shall not attempt to go into details regarding the position of British manufacturers in respect of export business. You are aware of the conditions that exist in other countries as compared with ours, and the exceptionally heavy taxation we have to bear. The handicaps against British manufacturers are both numerous and heavy. Last spring the then Chancellor of the Exchequer gave official figures as to the taxation per head of population—man, woman, and child—in this country and abroad. The taxation in this country was given as £15 18s. per head; in the United States, £6 14s. per head; and in Italy, £3 6s. 11d. per head. I learn that it has lately been officially stated in the House of Commons that the figure in France is about 441.5 frs., which works out at £5 11s. 5d. per head. The figure in Germany cannot be given with close accuracy, but a year ago I believe it was somewhere about £4. It was lately pointed out in the Press that the amount we are paying for income-tax includes 2s. 7½d. in the pound for war debts, of which amount 1s. 11d. in the pound is on account of the debts incurred by us in order to lend to our allies. While we are bearing this burden, our allies are relieved of their equivalent debt to us, and consequently relieved also of the taxation which they would have otherwise had to pay in order to liquidate these debts; so that this imposes on British manufacturers a crippling double handicap. If this heavy handicap of ours in the matter of taxation could be borne in mind by all classes of people in this country, they would realize more than ever the necessity for us to cut our own domestic expenditure—and consequently our taxation—down to the lowest limit, and to ensure the greatest output of all those things that we make for export, so as to bring down the cost.

Fuel Competition.

I believe that an essential condition of this country's future prosperity lies in the obtaining of cheaper fuel. It is necessary that we should have a larger output of coal, with a reduced cost, as fuel enters directly and indirectly into the cost of everything that is produced, including our food. Owing to the high cost of solid fuel, oil fuel is rapidly coming into use; and I believe we are going to see a great diminution in the use of solid fuel in the future. One has only to be on board a ship to realize the advantages of the use of oil fuel, even though it should cost the same as solid fuel. When a ship enters a port for fuelling purposes, in the case of oil, pipes are employed to convey it on board, and the filling of the tanks is conducted with speed and cleanliness, the least possible labour, and with no discomfort to the passengers; whereas with solid fuel the time and labour involved, and the dust and grime that fall to the lot of the vessel and the passengers, are things I need not enlarge upon. One cannot but reflect what a serious thing it would be for this country if these conditions were to lead to a general discontinuance of the use of solid fuel for shipping purposes; and the only way of avoiding this would appear to be for solid fuel to be so cheap as to prevent the general adoption of oil fuel by effective competition in price.

Our Imitators.

The progress of Radiation has been so striking as to involve us in one of the penalties of success—namely, that sincere form of flattery which lies in imitation; and our various apparatus have received a good deal of this attention for some time past—particularly so at present. Our own endeavour is to keep inventing and producing the best apparatus that experience and scientific research can evolve. We fully recognize that it is detrimental to our business that unsatisfactory apparatus should be offered by small makers. As an instance, take a gas-fire, which for long was looked upon with such prejudice, although fortunately this prejudice is now a thing almost wholly outgrown. If a gas-fire made by one of those makers finds a market on account of its price, and gives dissatisfaction to the user, the matter does not end there—the user condemns gas-fires as a whole, probably not knowing that there are perfectly satisfactory types to be had; and his bad opinion of them spreads.

The desirable thing in all interests is that all makers should produce gas-fires which give satisfaction. This would help the whole industry, as every gas-fire in use and giving satisfaction—no matter by whom it is made—will help to extend the general use of gas-fires. We want to see a healthy rivalry, not only in price, but in original inventions and improvements; but what we shall always denounce, and do everything in our power to prevent, is the producing and selling of imitations of those inventions which we have brought out at so great an expenditure of research, experience, and money. In recent times we have had to take legal measures against several imitators, not only in this country, but abroad; and in each instance the matter has been settled in our favour. There are still other important similar matters pending; and if the copyists are wise, they will realize that it is better for them to develop their own ideas rather than slavishly copy ours. Our motto is "Live and let live;" but it must be read to mean "Live at your own expense, and let us live at ours," although even then our work cannot but be helpful to others besides ourselves.

Research Work Development.

We are greatly extending and developing the research work of the Company. All along we have had in each of our works chemical and physical laboratories for research work, and in these we have also carried on regularly searching tests of all materials used in the construction of our apparatus, as well as the testing of all apparatus before it leaves the works. We are now constructing central research laboratories in London, on premises belonging to us and adjoining Radiation House. When these new central research laboratories are completed—which I hope will be in a month or two's time—they will constitute one of the finest and best-equipped research laboratories in the country, staffed by chemists of high scientific training, and of unrivalled special experience in all those branches of research with which our manufactures are concerned

While it is our intention primarily to devote all our energies to our own research work, we are cordial believers in co-operation and mutual assistance within the gas industry.

The "New World" and "New World Junior" Cookers.

In addressing you last year, I referred at some length to our new type of cookers, the "New World" and the "New World Junior," with the automatic heat-regulator called the "Regulo," which enables any person to use the oven with unerring certainty of success. This new type of cooker has completely transformed gas cooking. The cookers are not merely new patterns of apparatus, they are conceived upon new principles, only arrived at after years of research work and the expenditure of many thousands of pounds. The spontaneous encomiums they are constantly evoking is a great satisfaction to those of us who have been associated with the evolving of this type and the placing of it before the public. The new type has come to stay, and I regard it as among the most important assets of the Company. The reception of the "New World Junior" cooker affords every prospect of its realizing to the full our aim, that it should be—to repeat the "slogan" which I quoted to you last year—"A cooker for the million at a price for the million."

In passing, I must refer once more to the boiling burner in the hot-plate of these cookers which embodies a new principle, and which is called the "Rado." This type of burner has become the standard not only in this country but in our Colonies, and also, notwithstanding the difficulties of exchange and other obstacles, large numbers have been sold on the Continent and in various parts of the world. Imitators have done us the honour of copying this burner as near as they can; but they have still much to learn in order to produce a burner like the "Rado." The "Rado," to all intents and purposes, replaces the drilled-ring type of burner, as by its means the actual consumption of gas has been considerably reduced, and the combustion always remains complete; the burner cannot become clogged-up in use; and there is no risk of those unpleasant odours so often experienced in connection with the older types of gas cookers.

We spend a large amount in advertising our goods in the Daily Press and periodicals; but the benefit of much of our energy and outlay in this direction would be lost were it not for the enterprise of the gas undertakings, who, through their individual and organized efforts, make it so easy for householders to obtain and have fixed up any type of gas apparatus they may wish, with the least trouble and expense to themselves. Not only so, but the gas undertakings afterwards maintain a careful supervision of these apparatus in use.

"Thermo XX" Gas-Grates.

The sales of the Radiation "Thermo XX" injector-ventilator gas-grates last year have far exceeded all previous attainment. The injector-ventilator invention, as I have explained on a previous occasion, removes the last inequality of the gas fire as compared with the coal fire by giving ample ventilation of the room. It has no greater friend than the medical profession. At one time none con-

demned the use of the former types of gas fires and grates more than the doctors; but since our creation of the modern hygienic, ventilating, and silent gas-grate, doctors are among the greatest gas-fire advocates.

THE SMOKE PROBLEM.

The dense fogs experienced in this country during the present winter—and particularly in London—have directed renewed attention to what may be literally called "a burning question," and brought afresh before the public mind the important truth that it is not the factory smoke-stacks so much as the many thousands of domestic coal-fire chimneys which have so great a share of responsibility for these fogs. It is estimated that in London alone it costs a million pounds for each day that fog prevails. What it costs beyond this in sickness and impaired vitality due to the loss of the health-giving effects of sunlight is something far beyond calculation. It is coming more and more to be realized that sunlight is not merely a pleasant thing for the senses and a good thing for the life of plants, but that it is also a vital thing for the health of human beings. I hope the time is not far distant when legislation will be brought about to make it an offence to use any apparatus which helps to produce the "smoke-counterpane," as Carlyle would call it, which overspreads our country so much and so thickly. To burn solid fuel in its crude form in coal-grates is to do a grave injury to the community; and it is important to remember that when coal is burned in its crude form in an ordinary coal-grate, the direct waste of fuel is estimated at 5 p.ct., with a total loss of all the available bye-products, such as chemicals, disinfectants, oils, dyes, and many other things one could mention, which are so indispensable to us.

In telling you of the various matters connected with the Company's affairs, I have naturally dealt more particularly with the larger part of our business—namely, that which is concerned with the manufacture of gas apparatus and gas meters. Many of you, however, are aware that the business of our Company stands on a broad basis, and includes among its many activities a very extensive foundry business and a large enamelling business, and the goods made in our foundry business are extensively used in connection with all building schemes.

EDUCATION IN INDUSTRY.

There is a subject to which I have referred on a number of occasions, and which I do not propose to enlarge upon now, but merely to mention in passing—namely, the educational scheme for the teaching of the economics of industry to workpeople, a scheme which I took a leading part in initiating some years ago through the National Alliance of Employers and Employed. Last year I gave some details of the growth of this educational scheme, and it has extended enormously during the past year. It has so established its position, and proved the value of its work, that it has now received full recognition from the Board of Education. Those of you who are associated with any kind of works, and who may not have already given opportunities for your workpeople and staff to avail themselves of this scheme of education, I strongly urge to write to your local office of the N.A.E.E., and obtain the necessary information. I can assure you that if you adopt this scheme, after you have had it in operation for some little time you will find your workpeople and staff more intelligently appreciating the difficulties met with in carrying on your business in these days; there will be a better understanding between them and yourselves; more co-operation; and a disposition to give a better output. The outlook of your employees will be improved, and so will your own, and there will be a happier and more contented feeling all round.

AN INVESTORS' SECURITY.

When I first had the pleasure of addressing you as Chairman of Radiation, I said: "We want the Radiation shares to be recognized as an investors' security, and not as a speculators'; and it is the hope and aim of the Directors that Radiation should become known—by the steadiness of the Company's policy, and the absence of sensational occurrences in connection with the shares—as what I might call a gilt-edged industrial investment." I am referring to those remarks now in view of recent statements that have appeared in the Press and elsewhere. It is the policy of your Board to strengthen the internal affairs of the Company as far as it is humanly possible, so as to ensure against fluctuation in dividend, and to be prepared for the "rainy days" which at some time or other come to all manufacturing concerns.

As I have mentioned earlier, we are determined to extend our business by every proper means at our disposal; and as we extend the business, so we hope to put ourselves in a position to produce at a lower cost. The time may come when it may be possible for us to increase our dividend; but in the opinion of your Directors no increased dividend should be paid until the financial resources of the Company have been put in a position to withstand any stress that might come upon them, and we do not consider that time has yet arrived. It does not follow because a concern has made a profit that they ought to distribute it by way of dividend. We have greatly extended our various works, including purchases of additional land; we have to carry much increased stocks; and, consequently, our debtors are also greatly increased. This is a heavy call upon the resources of any business. Also each year opens with its potential difficulties in prospect, and this year is no exception. In industrial concerns there is always an element of the unknown which has to be allowed for, and that is why we are anxious that the resources of the Company should be so strengthened as to be in an absolutely stable position, safe against all contingencies which could be reasonably anticipated.

No doubt you and I, or most of us, have at one time or another bought shares of different concerns on mere hearsay as to the possibility of certain things happening in these particular concerns; and we have done this with varying results. If anyone has been buying Radiation shares in the hope of an early increased dividend, I am sure they will not desire to blame anyone else because they have not obtained what they looked for.

I will conclude, gentlemen, by moving:

"That the report and balance-sheet for the year ended Dec. 31, 1924, as presented by the Directors, be approved and adopted."

The report and accounts were adopted.

GAS REGULATION ACT APPLICATIONS.

There have appeared in the "London Gazette" the following notices regarding applications to the Board of Trade under the Gas Regulation Act.

SPECIAL ORDERS

Aldershot Gas, Water, and District Lighting Company.

The Company give notice of their intention to apply to the Board of Trade for an Order under section 10 to enable them to raise further money, and to make provision with respect to the voting at meetings.

Colchester Gas Company.

The Company are seeking a Special Order to authorize them to raise additional capital, to make further regulations in connection with the supply of gas, and for other purposes.

DECLARATIONS OF CALORIFIC POWER.

Houghton-le-Spring District Gas Company.—480 B.Th.U. (July 1.)
Swindon United Gas Company.—425 B.Th.U. (July 1.)

NUNEATON GAS PRICES.

280 B.Th.U. Gas.

The Nuneaton Gas Company, towards the end of last year, gave notice to the consumers that the calorific value of the gas which they intended to supply, as from March 11, would be 280 B.Th.U. per c.ft. Also that from the date of the current reading of the meters and the March collection of prepayment meters, the prices of gas (gas only, and not including hire) would be as follows: Prepayment consumers, gas only, 1s. 6·2d. per therm; 4s. 2·96 per 1000 c.ft. Prepayment consumers with hire-purchase fittings, 1s. 6·2d. per therm; 4s. 2·96d. per 1000 c.ft. Ordinary consumers, 1s. 6·2d. per therm; 4s. 2·96d. per 1000 c.ft. Cooker consumers (conditional), 1s. 3d. per therm; 3s. 6d. per 1000 c.ft. Gas fire consumers (conditional), 1s. per therm; 2s. 9·6d. per 1000 c.ft. Engine consumers (conditional), 9d. per therm; 2s. 1·2d. per 1000 c.ft.

The notice explains that the slot meters are set to cover the cost of gas, meter rent, and fittings on hire. Regarding the above prices by volume, it will be noted that 2·8 therms equal 1000 c.ft.

TRADE NOTES.

British Gas Purifying Materials.

The British Gas Purifying Materials Company, Ltd., whose head office is at No. 99, London Road, Leicester, and late of No. 13, Arcadian Gardens, Wood Green, N., have reopened a London office at No. 34/35, Norfolk Street, Strand, W.C. 2, which will be under the management of Mr. H. R. Hill, whose family have been closely connected with the gas industry since its inception.

Labour-Saving Machinery.

A reference book of information relating to the design and application of conveying, elevating, screening, and transmission machinery has been published by the Hebburn Conveyor Company, Ltd., of Wakefield. The guiding idea of this new publication has been to present illustrations and information of differing and typical installations, to assist probable clients in the selection of machinery.

CONTRACTS OPEN.

Resetting Retort Bed.

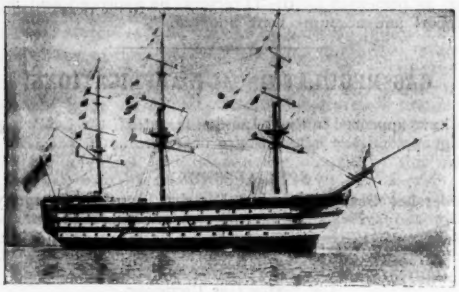
Tenders are invited by the Haworth Urban District Council for the resetting of retorts. [See advert. on p. 74.]

Exhausting Plant.

The Edinburgh Corporation are prepared to receive tenders for the supply and erection, at the Granton Gas-Works, of a steam-driven four-blade exhausting plant. [See advert. on p. 74.]

Colonial Gas Association Capital Issue.—The issue of preference shares in the Colonial Gas Association, Ltd., the abridged prospectus of which was advertised in the "JOURNAL" for March 18, has been largely over-subscribed. Letters of partial allotment are being sent out this week.

Barnard Castle Gas Company.—The question of undertaking the supply of electricity to the town is under the consideration of the Company. At the annual meeting on March 26 the report of the Directors showed that the sale of gas had increased during the year by nearly a million c.ft. The gross profit was £1219, while the net balance on profit and loss account was £676, which was available for dividend. An interim dividend was paid for the first half of the year, and it was decided to pay a like figure for the second half—4 p.ct. on the original consolidated stock, and £2 17s. on new ordinary stock, free of income-tax, absorbing £260 and leaving £416 to carry forward. The Directors reported that they had taken expert advice on the question of the electricity undertaking. The capital cost was estimated at £14,685, and the estimated revenue for the second year was £3460, leaving an estimated margin for profit of £990. The Directors thought, however, that there would be difficulty at the present time in raising the required capital. It was decided to ascertain by a canvass of the town the number of likely electricity customers.



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AND THE

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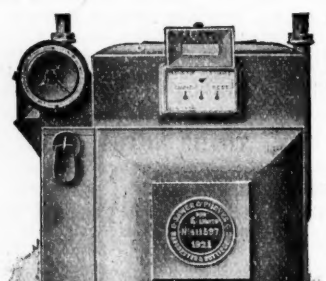

BOTH SUPREME!

SAWER & PURVES,

MILES PLATTING, MANCHESTER.

RADFORD ROAD, NOTTINGHAM.

45-47 WESTMINSTER BRIDGE RD., LONDON, S.E.1.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The same general idle conditions continue in the market, and prospects are in no way improved. Some days seem less depressing than others, when a few inquiries from abroad are circulating, but the end of them is generally "gone to Germany." Home demand is not improving, and stocks everywhere on the Continent are large. Consumers continue to buy only for their immediate requirements, and in very few cases can collieries see more than a short distance ahead.

A feature has been a further weakening of Northumberland screened steams, which now range between 16s. 9d and 17s. 6d. according to quality. Durham coals have not changed appreciably in value, though the demand remains as poor as ever. Wear Special gas makes quote 20s. 6d., but they can probably be had at considerably less than this for prompt definite business. Best qualities (Holmside, Boldon class) are nominally 20s., but obtainable, at any rate in the case of some of them, down to 19s. Other qualities are still 17s. to 17s. 6d. Best unscreened bunkers are about 18s. 3d., and coking unscreened still in poor demand at 17s. 3d. to 17s. 6d.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The increasing seriousness of the position as the volume of demand contracts and the ratio of overhead charges grows, deepens the anxiety which is felt in every branch of the trade. It is stated that 90 p.ct. of the gas undertakings are in arrear of their contracts. Stocks are so heavy that it is not easy to see how the leeway is to be made up. There is speculation as to what effect this will have upon new contracts when the time comes for negotiation. The market for both household and industrial fuel has become extremely sluggish. Stocks in intermediate hands suffice to satisfy a considerable part of the current demand. The position at the collieries can be inferred from the promptitude with which orders are dispatched. Depreciation of values is accentuated in all descriptions of coal save the best household grades. Two or three weeks are still required for delivery of the latter. The consumption of works fuel tends to decline. In the Staffordshire iron trade, a large amount of plant is idle, and works that are not stopped are running in many cases intermittently.

The stagnation in the p'g iron trade reacts on the coke market. Prices are precarious, and the view of ironmasters is that trade recovery is only possible with cheaper fuel. How this is to be reconciled with the present cost of coal-getting, and the unsatisfactory yield of residuals, is the problem to be solved.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

There is no material alteration in the situation of the coal trade in Yorkshire and Lancashire. Gas coal is moving slowly, with indications of decreased prices for renewals of contracts.

House coal continues steady, with prompt supplies available at the majority of the producing points.

Although a better tone prevails among certain of the industrial coal consuming centres, there is no apparent increase of business, notwithstanding that low prices are being quoted for prompt deliveries of the lower-grade fuels. What difference the irregular working of collieries in the near future will make is problematical; but the outlook suggests that some kinds of slack may become scarcer.

The slump in export still continues, with no prospects of improvement, and prices for all qualities are in consequence exceptionally low.

Humber bunker and export prices (f.o.b. usual shipping ports) at the week-end were: South Yorkshire: Hards, Association, 19s. 6d.; screened gas coals, 19s. 6d. to 20s. 6d.; washed trebles, 20s. 6d. to 21s.; washed doubles, 17s. 6d. to 18s.; washed singles, 17s. 3d. to 17s. 9d.; washed smalls, 13s. to 13s. 6d.; unwashed doubles, 15s. 9d to 16s. 3d.; rough slack, 11s. to 11s. 6d.; smithy peas, 20s. 6d. to 22s.; West Yorkshire Hartleys, 17s. to 19s.; screened gas coal, 19s. to 20s.; washed trebles, 18s. 6d. to 19s.; washed doubles, 16s to 16s. 6d.; washed singles, 16s.; washed smalls, 13s.; unwashed doubles, 13s. 6d. to 14s. 6d.; rough slack, 11s. to 11s. 6d.; coking smalls, 10s. 6d. to 11s. Derbyshire and Nottinghamshire: Top hards, 19s. 3d. to 20s.; washed trebles, 18s.; washed doubles, 18s.; washed singles, 17s. 6d.; washed smalls, 12s. 6d. to 13s.; unwashed doubles, 15s. to 16s.; rough slack, 10s. 6d. to 11s. 6d. Yorkshire, Derby, and Notts: Screened steam coal, 16s. 6d. to 18s.; gas coke, 21s. to 23s.; furnace coke, 17s. 6d. to 18s. 6d.

Queenstown Gas Company.—Presiding at the annual meeting of this Company, Mr. John Roonon (Chairman) pointed out that the bank overdraft had been increased, owing chiefly to a debenture of £600 having been redeemed during the year, and, for the rest, to recent changes in the gas industry—the introduction of cookers and heaters, and the fitting-up of appliances at the Company's expense, which naturally led to more capital being required. To meet this demand they had to borrow, as the troubled conditions that had prevailed in Ireland were not, of course, favourable to raising capital otherwise. When conditions were more settled they would, he hoped, be able to raise capital for further development. He conveyed to Mr. W. E. Young (Resident Manager) and the staff the thanks of the Directors for their loyalty and support. The report was adopted and the statutory dividend declared. At an extraordinary meeting, held subsequently, the Directors were authorized to borrow, if they thought fit, to the extent of the Company's unexercised powers.

STOCK MARKET REPORT.

THE announcement of the new Government Conversion Loan was the event of the past week. The terms of the issue, which is for £30,000,000 3½ p.c. stock with a minimum price of 76¾, were almost identical, after allowing for the periods of the first interest, with those of the last issue. Fears of dearer money are still prevalent in the City, and the uncertainty continues to dominate the stock and share markets.

The 5 p.c. War Loan remains the cheapest stock in the gilt-edged section, and taking the four months' accrued interest into account can be purchased at below par. Foreign bonds were neglected. Home Rails improved slightly, though the business done was insignificant.

The Industrial Market generally was also depressed. Courtaulds fell away by about 2s. 6d., due possibly to "bear sales." The Dunlop report made a good impression, notwithstanding the fact that there is again no dividend. There has been a good deal of criticism of the Harland and Wolff report, and subscribers to the issue last year of preference shares, which have dropped from £1 to 14s., have good reason to ask for more information with regard to the Company's working.

In the Gas Market the depression still continues. It will be seen from the Table that the Brentford stock dropped a further 2 points to 103-108, which, when one considers that on the news of the amalgamation with the Gas Light Company becoming known transactions took place at 118, is significant, notwithstanding that the Bill has passed the third reading in the Commons. The variation in the quotation of the Gas Light ordinary (now 88½-90½) and the Commercial 4 p.c. (91-94) is surprising, in view of the fact that at the present prices of gas, 8·6d. and 9·74d. per therm respectively, the authorized dividends for the current half-year are the same—viz., £5 6s. 8d. p.c. per annum. An important change is the fall of 4 points in the South Suburban ordinary to 100-105. There will shortly be an inquiry into this Company's standard price. The announcement of the Tottenham Company's revised standard is doubtless the cause of the 2¼ points fall in the "B" stock; the "A" stock so far has not been affected.

The following transactions were recorded during the week:

On Monday, Bristol 5 p.c. maximum 93¾, Commercial 4 p.c. 91½, 3½ p.c. 91½, 3 p.c. debenture 58, Gas Light and Coke 89¾, 90¼, 90⅜, 3½ p.c. maximum 63½, 4 p.c. preference 79, 3 p.c. debenture 60¼, Imperial Continental 178½, 180, Primitiva 7s. 9d., 8s. 1½d., 8s. 3d., 4 p.c. 1st debentures 79⅞, 80, South Metropolitan 95¼, 96½, 96½, 3 p.c. debenture 61¼, Swansea 7 p.c. preference 102½, Tottenham "B" 101, Wandsworth "B" 114. Supplementary prices, Ascot new 6 p.c. preference 10½, 10⅝, Kingston-upon-Thames 105½, 105½, Wandsworth 3½ p.c. new 97.

On Tuesday, Alliance and Dublin 70⅛, Bristol 5 p.c. maximum 93, 93½, Continental Union 7 p.c. preference 89, European 6¾, Gas Light and Coke 89½, 89½, 89¾, 90, 4 p.c. preference 79¾, Hastings and St. Leonards 5 p.c. 94¼, 94⅜, Hornsey 137½, 138, Imperial Continental 181, Primitiva 7s. 9¾d., 8s. 1¼d., 4 p.c. 1st debentures 79⅞, 80, South Metropolitan 95¼, 95½, 95⅝, 95½, 96, Tottenham "B" 100. Supplementary prices, Bath 5 p.c. debenture 97¼, Southend-on-Sea 5 p.c. new "B" 88½, 89.

On Wednesday, Alliance and Dublin 4 p.c. debenture 67½, Bombay 5⅛, Brentford "A" 105, European 6½, 6⅝, 6⅛, 6¾, 6⅛, Gas Light and Coke 89, 89¾, 4 p.c. preference 79¼, 3 p.c. debenture 61, Hastings and St. Leonards 5 p.c. 94¾ *ex* div., Montevideo 64½, 65, Primitiva 8s. 3d., 4 p.c. (River Plate) debenture 65½, 66¼, Sheffield "B" 102¾ *ex* div., South Metropolitan 95, 3 p.c. debenture 60½, South Suburban 104.

On Thursday, Commercial 4 p.c. 91, Continental Union 37, 37½, European 6⅝, 7, 7⅛, Gas Light and Coke 89, 89½, 89½, 89⅝, 89¾, 3½ p.c. maximum 63¼, 63½, 4 p.c. preference 78½, 80, Imperial Continental 180, Liverpool 7 p.c. preference 103½ *ex* div., Montevideo 64½, 65, Primitiva 8s. 3d., 8s. 4½d., 4 p.c. 1st debentures 79¾, 80, San Paulo 6 p.c. preference 7⅞, 7⅛, *ex* div., South Metropolitan 94, 94⅞, 95, 95½. Supplementary prices, Gas Light and Coke 10 p.c. bonds 198.

On Friday, Bombay 5¼, Cape Town 7½, 4½ p.c. preference 6½, 4½ p.c. cons. 1st mt. debenture 73, European 7½, Gas Light and Coke 88¾, 89½, Imperial Continental 182, Primitiva 8s. 1½d., 8s. 9d., South Metropolitan 94½, 94¾, South Suburban 5 p.c. 100, Southampton 84, 84½, Tottenham "A" 119, "B" 100, Wandsworth (Wimbledon) 111, 112. Supplementary prices, Cheltenham 5 p.c. max. 78½.

Money was scarce in Lombard Street last week, and a small amount had to be borrowed from the Bank of England at 5½ p.c. The Treasury Bill rate rose again; the average rate at which bills were issued being £5 7s. 1·59d. p.c.t.

The fall in the dollar-sterling exchange on Friday to 4.77⅛ was reported to be due to false reports having reached New York that Great Britain had decided to postpone the restoration of the gold standard. The rate subsequently recovered to 4.77⅛, but fell again to the former figure on Saturday. French francs eased to 90.45, and Belgian francs to 93.15, but Italian lire were firm at 116.87½.

Both Silver and Gold cheapened on the week at 31⅝d. and 86s. 5d. per oz. respectively.

The Bank Rate is 5 p.c., to which it was raised from 4 p.c. on March 5. Bankers' deposit rates are 3 p.c. The deposit rates of the discount houses are 3 p.c. at call and 3½ p.c. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Mar. 27.	Rise + or Fall − on Week.	Transaction Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C.	78—81	..	..
295,492	,,	,,	4	4	Do. 4 p.c. Pref.	71—76	..	..
1,551,868	,,	Sept. 25	6	6½	Alliance & Dublin Ord.	65—70	..	70⅛
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb.	61—66	..	67½
300,000	5	Oct. 23	8	8	Bombay, Ltd.	5—5¼	..	5⅛—5¼
100,000	10	Mar. 5	8½	8½	Bournemouth 5 p.c.	12—13	..	..
425,050	10	,,	7	7	Do. B 7 p.c.	12½—12¾	..	..
150,000	10	,,	6	6	Do. Pref. 6 p.c.	10½—11¾	..	..
50,000	Stk.	Jan. 8	3	3	Do. 3 p.c. Deb.	56—59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	76—79	..	..
992,045	,,	Mar. 5	6⅛	6⅛	Brentford A Con.	103—108	−2	105
990,500	,,	,,	6⅞	6⅞	Do. B New	103—108	−2	..
76,000	,,	,,	5	5	Do. 5 p.c. Pref.	95—98	..	..
306,690	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	76—81	..	..
181,337	,,	,,	6	6	Do. 6 p.c. Rich. Red. Deb.	100—105	..	..
214,740	,,	Mar. 5	12½	12½	Brighton & Hove Orig.	165—170	..	..
244,200	,,	,,	8½	9½	Do. A Ord.	122—125	..	..
1,287,500	,,	Feb. 19	4	5	Bristol 5 p.c. max.	96½—97¼*a*	..	93—93¾
855,000	,,	Mar. 19	8	7	British Ord.	112—117*	..	..
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.	123—128	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	72—77	..	..
100,000	10	Dec. 18	8	6	Cape Town, Ltd.	7—8	..	7½
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref.	6—7	..	6½
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb.	71—76	..	73
626,860	,,	Feb. 19	6	6	Cardiff Con. Ord.	101—104	..	..
237,860	,,	Jan. 8	7½	7½	Do. 7½ p.c. Red. Deb.	104—107	..	..
157,150	,,	Feb. 19	5	6½	Chester 5 p.c. Ord.	89½—94½*b*	..	..
1,513,280	,,	Mar. 5	6	5/14/8	Commercial 4 p.c. Cap.	91—94	..	91—91½
560,000	,,	,,	6	5⅞	Do. 3½ p.c. Cap.	91—94	..	91½
475,000	,,	Dec. 18	3	3	Do. 3 p.c. Deb.	57—60	..	58
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd.	37—42	..	37—37½
200,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.	88—92	..	89
660,000	,,	Mar. 5	6½	6½	Croydon sliding scale	100—103	..	..
284,975	,,	,,	5	5	Do. max. div.	83—86	..	..
492,270	,,	Feb. 19	6	9	Derby Con.	110—112*c*	..	..
55,000	,,	Jan. 8	4	4	Do. Deb.	74—76*c*	..	..
1,002,180	,,	Jan. 22	6	4	European, Ltd.	7—8	..	6½—7½
16,460,070	Stk	Feb. 19	5¾	5¾	Gas Light & Coke 4 p.c. Ord.	88½—90½	−1	88⅝—90⅜
2,600,000	,,	,,	3¼	3¼	Do. 3½ p.c. max.	62—65	..	63½—63¾
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78—80	−1	78⅝—80
4,761,930	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb.	59—62	..	60¼—61
130,000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	198
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 19	6½	6½	Hastings & St. L. 5 p.c. Conv.	92—97*	..	94½—94¾
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	73—78*	..	..
70,000	10	Sept. 25	10	10	Hongkong & China, Ltd.	16—17	..	..
86,600	Stk.	Mar. 5	10	10	Hornsey 7 p.c.	138—143	..	137½—138
1,976,000	,,	Nov. 20	30	10	Imperial Continental Cap.	178—183	+3	178½—182
263,950	,,	Feb. 5	3½	3½	Do. 3½ p.c. Red. Deb.	71—74	..	..
235,242	,,	Mar. 19	6½	6½	Lea Bridge 5 p.c. Ord.	96—101*	..	..
2,127,340	,,	Feb. 19	5½	5½	Liverpool 5 p.c. Ord.	87½—88½*b*	..	..
600,000	,,	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	101—103*b*	−½	103½
165,736	,,	Feb. 19	9	8	Maidstone 5 p.c. Cap.	122—132	..	..
63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb.	54—59	..	..
75,000	5	Dec. 4	7	5	Malta & Mediterranean	4—4½	..	..
541,920	Stk.	Nov. 20	4	4	Montevideo, Ltd.	62—67	..	64½—65
2,061,315	,,	Mar. 5	5	5	Newcastle & Gateshead Con.	81—82*d*	−½	..
300,929	,,	,,	4	4	Do. 4 p.c. Pref.	72½—73½*d*	..	..
529,705	,,	Dec. 18	3½	3½	Do. 3½ p.c. Deb.	68—69*d*	..	..
15,000	10	Mar. 5	11	12	North Middlesex 10 p.c.	15½—16½	..	..
75,940	10	,,	7⅞	8⅝	Do. 7 p.c.	11—11½	..	..
300,000	Stk.	Dec. 4	7	9	Oriental, Ltd.	102—107	..	..
188,120	,,	Jan. 8	7¼	7½	Plym'th & Ston'house 5 p.c.	109—114	..	..
60,000	50	Mar. 5	13	14	Portsea Island B	96—99	..	..
100,000	50	,,	12	13	Do. C	93—98	..	..
2,289,909	1	—	—	—	Primitiva Ord.	8/0—9/0	+/3	7/9—8/9
311,100	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	79—81	..	79½—80
600,000	Stk.	Jan. 22	4	4	Do. 4 p.c. Red. Deb. 1911	63—65	..	..
220,335	,,	Dec. 18	4	4	Do. B. Aires 4 p.c. Rd. Db.	65—67	..	..
321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	65—67	..	65½—66½
150,000	10	Mar. 19	6	6	San Paulo 6 p.c. Pref.	7½—8*	..	7⅞—7⅞
125,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb.	43—46	..	..
270,000	Stk.	Aug. 28	5/8/4	5½	Sheffield A	104—106*e*	..	..
419,968	,,	,,	5/8/4	5½	Do. B	104—106*e*	..	102¾
1,047,000	,,	,,	5/8/4	5½	Do. C	104—106*e*	..	..
90,000	10	Oct. 23	8	6	South African	7—9	..	..
6,609,895	Stk.	Feb 19	5	6½	South Met. Ord.	94—95	−1½	94—96½
1,895,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb.	59—62	..	60½—61½
734,000	,,	Mar. 5	6½	6½	Do. 6½ p.c. Red. Deb.	102½—104½	..	..
91,500	,,	Mar. 5	8½	8½	South Shields Con.	135—136*d*	..	..
1,187,795	,,	Feb. 19	6½	6½	South Suburban Ord. 5 p.c.	100—105	−4	100—104
368,857	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	97—100	..	..
647,740	,,	Nov. 6	5	5	South'mpt'n Ord. 5 p.c. max.	83—86	..	84—84½
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	72—77	..	..
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref.	101—103	..	102½
200,000	,,	Dec. 18	6½	6½	Do. 6½ p.c. Red. Deb.	103—105	..	..
120,000	,,	Feb. 19	8	8	Tottenham District A 5 p.c.	116—119	..	119
882,275	,,	,,	6½	6½	Do. B 3½ p.c.	97½—100½	−2½	100—101
181,255	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	75—79	..	..
258,251	,,	Mar. 19	5	5	Tynemouth Con. and New	77—79*d*	−2	..
197,294	,,	Feb. 19	6½	6½	Uxbridge, Maidenhead, & Wycombe 5 p.c.	100—105	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref.	93—98	..	..
91,860	,,	,,	—	6½	Do. 5 p.c. Maidenh'd	90—95	..	..
30,000	,,	Mar. 5	9½	9½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	135—140	..	..
255,636	,,	,,	7½	7½	Do. B 3½ p.c.	114—119	..	114
392,955	,,	,,	6/9/6	6/9/6	Do. C and New	97—102	..	97
352,000	,,	,,	7½	7½	Wimbledon 5 p.c.	109—114	..	111—112
98,000	,,	,,	7½	7½	Epsom 5 p.c.	117—122	..	..
88,416	,,	Dec. 18	3	3	3 p.c. Deb.	57—60	..	..

Quotations at :—*a*,—Bristol, *b*,—Liverpool, *c*,—Nottingham, *d*,—Newcastle, *e*,—Sheffield. * Ex. div.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *March* 30.

There is no alteration to record in pitch in the London market—the position remaining as last reported.

Creosote also is unchanged at from 7⅞d. to 7½d. per gallon net and naked at works.

Solvent naphtha is in good demand, and supplies are scarce. The price is firm at about 1s. 8d. net per gallon for the 95/160 quality.

Pure benzole and pure toluole are about 1s. 10d. to 1s. 11d. net per gallon.

Tar Products in the Provinces.

March 30.

There is very little fresh to report concerning the markets for tar products.

Although there has been a little inquiry for pitch, there is no alteration in the price.

Creosote remains the same.

Benzole and solvent naphtha are steady.

The average values for gas-works products during last week were: Gas-works coal tar, 29s. 3d. to 34s. 3d. Pitch, East Coast, 40s. to 41s. f.o.b. West Coast—Manchester, 35s. to 36s.; Liverpool, 36s. to 37s.; Clyde, 39s. to 40s.; Benzole, 90 p.ct., North, 1s. 7½d. to 1s. 8½d.; crude, 65 p.ct., at 120° C., 10½d. to 11½d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 2d. to 1s. 3d. Toluole, naked, North, 1s. 7½d. to 1s. 8½d., nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 1s. 5d. to 1s. 6d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 6¼d. to 6½d.; salty, 6¼d. to 6½d.; Scotland, 6d. to 6¼d. Heavy oils, in bulk, North, 6⅞d. to 7d. Carbolic acid, 1s. 6d. to 1s. 7d. prompt. Naphthalene, £12 to £15; salts, £4 to £5, bags included. Anthracene, "A" quality 3d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Commercial Gas Company's Increased Price.—The Commercial Gas Company announce an increase in the price of gas from the Lady Day quarter from 8⅛d. per therm to 9⅜d. for quarterly consumers and 10⅝d. to 11⅞d. per therm for automatic meters.

Sheffield Gas Company.—The third annual dinner of the Angling Section of the Company's Sports and Social Club was held on Friday, March 20. There were 71 members and friends present; and the Hon. President of the Club, Mr. Ralph Halkett (General Manager and Secretary of the Company), presided.

Gas Meter Manufacturers and Inspectors at Manchester.—On Wednesday, March 25, the Executive Committee of the Statutory Gas Meter Inspectors' Association of Great Britain met at the Gas Meter Testing Station, Manchester, under the presidency of Mr. G. Hume (London). Assembling in the same rooms on Thursday, the inspectors were joined by Mr. H. N. Barrow (Chairman) and most of his colleagues on the City Justices Gas Meter Testing Committee. The party were entertained at luncheon in the Town Hall, at the invitation of the Lord Mayor (Alderman F. J. West), who presided. He said that they had every reason to be proud of the Manchester Testing Station. Sir Henry Cowan moved a vote of thanks to the Lord Mayor. Mr. Braddock and Mr. Templer Depree were present at the luncheon.

Sheffield Illumination Society.—At a meeting of the Society held on March 26, Mr. Ralph Halkett, the General Manager and Secretary of the Sheffield Gas Company, gave a lecture entitled "Gas Topics," treating the subject in a general and popular way.

Lewes Gas Company.—Gratifying progress was reported at the half-yearly meeting of the Company, at which Mr. E. Monk (Chairman) presided. He said that the revenue account showed a profit of £2181 for the half-year. After providing for income-tax, interest on mortgages, &c., the balance of net revenue was £2507. The Directors recommended the payment of dividends for the half-year at the rate of 5 p.ct. on the original stock, and 3½ p.ct. on the additional stock. Mr. Monk drew attention to the increase in the sales of gas.

Exmouth Gas Company.—The annual meeting of the Company was held on March 26—Rev. C. R. Carr presiding. A dividend of 7 p.ct. (less tax) for the past year was recommended on the consolidated ordinary shares. The sales for the year showed an increase of 30,756 therms over the year 1923; this being equal to 6·6 p.ct. In order to meet the increasing demands for gas, the installation of additional plant at the works, and the extension and enlargement of the district mains were under consideration. The Chairman, in moving the adoption of the report, congratulated the Company on another successful year's trading.

Dartmouth Gas, Coke, and Coal Company, Ltd.—Proposing the adoption of the annual report at the general meeting of the shareholders of the Company, Mr. Harold Adams said the working profit for the year was £2268. The receipts from the sales of gas, coke, and sulphate of ammonia had been maintained, and in each case slightly increased revenue was shown, but there was a reduction of £80 from the revenue for tar. There had been a steadily increasing demand for gas. The distribution of the full dividend of 5 p.ct. on the second preference shares and 10 p.ct. on the ordinary shares was recommended; and it was proposed to carry the sum of £500 to the general reserve fund account, and £500 to the reserve fund account for repairs, maintenance, and renewals of plant and works. A reduction of 4d. per 1000 c.ft. would be made from April 1. In order to encourage the permanent employees to provide for their old age, the Directors inaugurated a contributory pension scheme last December.

At a recent meeting of the Whitwell Parish Council, it was decided to ask the local Gas Company for a reduction in the price of gas, which is now 5s. 6d. per 1000 c.ft.

At a whist tournament and dance given at Devonport in connection with the Plymouth Corporation Gas-Works Sports Club, the prizes were given by the Chairman (Mr. J. C. Tozer) and Vice-Chairman of the Gas Committee, and the staff of the Gas Department.

The Leeds Corporation Gas Committee recently considered whether or not the price of gas should be increased in view of the past year's working having shown a deficit of £28,000. It was decided that such a course would be inexpedient. The present price is 3s. 9d. per 1000 c.ft.

At a recent meeting of the Morecambe Gas Committee, the Town Clerk reported that the Ministry of Health had sanctioned the following loans: Extension of mains, £3690; carburetted water gas plant, £2660; washer, £2572; land, £1285; building for carburetted water gas plant, £1000; and meter, £340.

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